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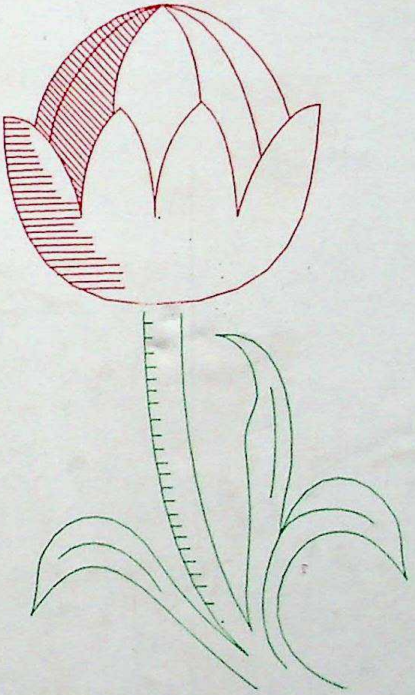
SPIRIT & SCIENCE

(For young minds)



By

Sat Lal Razdan

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To

Dear T. N. Koul,

With all my best wishes.

15.3.2001

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By

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Spirit & Science

By

Sat Lal Razdan

© Author

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Dedicated to my dear fellow - teachers and dear old boys and girls.

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PREFACE

The purpose of writing this book "Spirit and Science" is to inculcate spirituality and scientific method and outlook among the young generation so that they grow up respecting all religions as their own and loving their fellow beings. They should be able to live as citizens of the world and at the same time follow their own religion. They should also imbibe scientific outlook and shed all hatred and narrow-mindedness.

My active, successful, continuous and result oriented teaching of physical science and moral science for about 53 years (June 1945 to December 1998) to boys and girls mostly between 14 and 16 years of age has prompted me to write this book. The book is a guide for all, but mostly for adolescents.

The book has two sections. Section A contains spiritual quotations and sayings collected and preached during my teaching period, one each for the days

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in the calendar year and spiritual poems and short stories. Section B contains typical everyday science topics and simple science experiments which the boys and girls can easily perform. The experiments will give right foundation for the young to develop scientific bent of mind.

The book is meant to give right direction to all growing children and youth regarding their behavior, building their attitude to enjoy right living and making them work hard to attain basic spiritual and science knowledge. It is my prayer that the book serves all students to live a happy, healthy, great and purposeful life. "Children are people. They grow into tomorrow only as they live today," John Dewy

"A child is like a sapling you plant. It grows into a tree and in your old age you can sit under it for shade"

1st June 2000 **Author**

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SECTION A

SPIRIT

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QUOTATIONS AND WISE SAYINGS (FOR 366 DAYS OF THE YEAR)

1. A candle consumes itself but lights others.
2. If you take care of others, God takes care of you.
3. Seek your happiness more in what you give than in what you get.
4. "May we follow the path of goodness as the sun and the moon follow their path !" Rigveda.
5. Seize to- day, and put as little trust as you can in the morrow.
6. Success lies in the motto of exerting yourself a little more and doing a little better.
7. He will have the fruit who shall climb up the tree.
8. No man ever became great or good except through many and great mistakes.
9. Honesty and integrity are best taught by example.
10. A champion of righteousness makes no distinction between friend and foe.
11. "The world is my family", Mahatma Gandhi.
12. "The life is short, the vanities of the world are transient, but they only live who live for others, the rest are more dead than alive" Swami Vivekanand

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13. Up, sluggard, waste not life; in the grave will be sleeping enough.
14. The poorest man is he whose only wealth is money.
15. Punishment is man- like but forgiveness is God -like.
16. Pray to God and keep rowing to the shore.
17. A good example is the best sermon.
18. The remedy for worry is to get occupied doing something constructive.
19. What I do to-day is important because I am giving a day of my life for it.
20. Softly, Softly catch ye monkey.
21. There is no pillow softer than clear conscience.
22. Idea has become all-important and not action!
23. Speak kind words and you will hear kind echoes.
24. It is easy for a silly goat to bring down a barn-gate, but only a skilful carpenter can build one.
25. Though the mills of God grind slowly, they grind exceedingly well.
26. A good book is the best of friends, the same to-day and forever.
27. Begin not with a programme but with a deed.
28. Great actions speak great man.
29. Silence is sometimes more eloquent than speech.
30. Genius is one- percent inspiration and ninety nine

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percent perspiration.

31. To labour is to pray to God.

32. Nature is the living garment of God and we must love it.

33. You cannot climb the ladder of success with hands in your pockets.

35. If wealth is lost, nothing is lost; If health is lost, something is lost, if Character is lost, everything is lost.

36. Constant occupation prevents temptation.

37. A bee is honoured more than other insects not because she labours but that she labours for others.

38. Those who live in glass houses should not cast stones at others.

39. There is no greater victory than that of controlling oneself

40. Shed hatred and not blood.

41. A soft answer turneth away wrath.

42. Best be yourself, impartial, plane and true.

43. The real aim of education must be to get each one out of his isolated class into the one humanity.

44. There is not a single moment in life when man cannot serve.

45. A ploughman on his feet is higher than a gentleman on his knees.

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46. Anything done for another is done for oneself.
47. The world is like a mirror, if you smile, it smiles, if you frown, it frowns back.
48. God has given us two eyes, and two ears, but one tongue, see and hear more than you speak.
49. We make living by what we get, but we make life by what we give.
50. "An eye for an eye only ends up in making the whole world blind", Mahatma Gandhi.
51. The devil can quote scripture for his purpose.
52. We should do good work, it does not matter who gets the credit for it.
53. " I cannot conceive of any other better way of worshipping God than serving the poor", Mahatma Gandhi
54. "There is enough in the world for man's need but not enough for man's greed", Mahatma Gandhi
55. "There never was a good war or a bad peace". Benjamen Franklin.
56. "Only the live fish swim against the current", Tyndale Biscoe.
57. A rose can live amongst the thorns and yet never be injured by them.
58. If you always do your best, you will be free from regrets.
59. The only way to gain respect is firstly to give it.

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60. To have balance in all situations is the key to happiness.
61. The two great healers are God and Time.
62. "If you want a thing done well, do it yourself". Napolean Bonapart.
63. "Peace cannot be kept by force, it can only be achieved by understanding", Albert Einstein.
64. If we take one stride towards God, he takes ten strides towards us.
65. Greatest religion is to rise to the universal brotherhood.
66. Do not forget to entertain strangers, for thereby some have entertained angels unawares.
67. "The only alternative to co-existence is co-destruction". Pandit Jawahar Lal Nehru.
68. Every temptation is a test of your strength.
69. Ignore criticism when you are right and pay heed to it when you are wrong.
70. God brings men into deep waters not to drown them. but to cleanse them.
71. God bears with wickedness but not forever.
72. It is always darkest before the day dawneth.
73. Noble deeds that are concealed are most esteemed.
74. Each thought, word and deed lays up a store for you
75. " I complained because I had no shoes until I saw

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a man who had no feet"

76. "The secret of life is never to have an emotion that is unbecoming". Oscar Wilde.

77. God visits us often but most of the time we are not at home.

78. We have no more right to consume happiness without producing it than to consume wealth without earning it.

79. Many are invited but few are selected.

80. Plough deep while sluggards sleep.

81. Compassion will cure more sins than condemnation

82. It is neither wealth nor splendour but tranquility and serviceable occupation, which give happiness.

83. "He that loveth not knoweth not God for God is love", Bible

84. Life is a process of struggle. Do not hope of getting anything without struggle.

85. Behaviour is the mirror in which everybody displays his image.

86. Live always as if you were under the very eye of the supreme.

87. They serve God most who serve His creatures.

88. "Make yourself an honest man and then you may be sure that there is one less rascal in the world", Thomas Carlyle.

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89. If you want to be loved, show more of your faults than virtues.

90. It is better to light candle than to curse darkness.

91. A man of responsibility can always be free. An irresponsible person will always be a slave.

92. Make friends with all but trust a few.

93. "The Lord prefers common-looking people. That is the reason He makes so many of them". Abraham Lincoln.

94. As is a tale, so is life, not how long it is , but how good it is!

95. We live in deeds, not in years.

96. World can be good and pure only if our lives are good and pure.

97. They only live who live for others; the rest are more dead than alive.

98. What you are is God's gift to you; what you become is your gift to God.

99. If all your knowledge comes though books, you are more often wrong than right.

100. A righteous person is he who gives more than he receives.

101. The sun needs no flattery.

102. You cannot travel far if you are anchored.

103. Old age is state of mind, not state of health.

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104. He that fears death lives not.
105. Dishonest money dwindles away.
106. Diet cures more than the doctor.
107. "Determine that the thing can and shall be done, and then we shall find the way". Abraham Lincoln.
108. Smooth seas do not make skilful sailors.
109. If you can't make a mistake, you can't make anything.
110. None are so empty as those who are full of themselves.
111. The greater the outward show, the greater the inward poverty.
112. The Dead take to the grave, clutched to their hands, only what they have given away.
113. Honest labour bears a lovely face.
114. Better to live in harmony then to die in fighting.
115. Beauty without virtue is a flower without perfume.
116. If you see any good in others, make it your own.
117. A wise man learns from the errors of others.
118. God's great power is in the gentle breeze and not in storm.
119. The fewer your wants, the nearer you resemble gods.
120. There are no gains without pains.
121. To fear difficulties is to lose manliness.
122. One and God make a majority.
123. "The religious pursuits are merely cloaks of respectability", J. Krishnamurti.

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124. "The actual is- the life in the present, the crowded street, our business, our immediate relationship, these should be pleasing and gratifying" J. Krishnamurti.

125. "We cannot imagine life without a problem. Only the dead have no problem". Pandit Jawahalal Nehru.

126. "When angry, count 10 before you speak. If very angry, 100" Thomas Jefferson.

127. We must learn to live together as brothers or perish together a› fools.

128. A great city is that which has the greatest men and women.

129. "Labour to keep alive in your breast that little spark of celestial fire called conscience". George Washington.

130. "Cowards die many times before their death; The valiant never taste of death but once". William Shakespare.

131. "There is nothing certain in man's life but this; That he must lose it", Earl of Litton.

132. Education is discipline for the adventure of life.

133. Education has for its object the formation of character.

134. The created world is but a small parenthesis in eternity.

135. "Many foxes grow grey, but few grow good" Benjamin Franklin.

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136. A wolf may lose its teeth, but not its nature.

137. "A poor relation is the most irrelevant thing in nature". Charles Lamb.

138. "Man was born free, and everywhere he is in chains". Rousseau.

139. The hand that gives gathers.

140. It is more blessed to give than to receive.

141. To be good only to yourself is to be good for nothing.

142. The worst boss anyone can have is a bad habit.

143. Happiness is a wondrous commodity; the more you give, the more you have.

144. With each little good act, each little good word, and with each little good thought, a person reaps a harvest of happiness.

145. Strength does not come from physical capacity. It comes from indomitable will.

146. Marvel at the majesty of nature, let its beauty soothe our hearts.

147. If you want to succeed, do not stare the stairs, climb it one by one.

148. He who doesn't hope to win has already lost.

149. Give the world the best you have and best will come back to you

150. To-morrow can only be what you have made to-day.

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151. Sin has many tools but lie is the handle which fits them all.

152. No father has given his child anything better than good manners.

153. The work well done is an opportunity to do more.

154. The mind controlled and guided will free us from bondage.

155. All truly great thoughts are conceived while walking.

156. There are many religions but there is only one morality.

157. A soft answer turneth away wrath, but grievous words stir up anger.

158. A little explained
A little endured,
A little forgiven,
A quarrel is cured.

159. Little strokes fell great oaks.

160. Anger is momentary madness.

161. A good book is the purest essence of human soul.

162. Work gives worthiness.

163. "I am not interested in excuses for delay, I am interested in seeing things done". Jawaharlal Nehru.

164. Violence is the weapon of the weak, non violence that of strong.

165. "Those who deny freedom to others, deserve it not for themselves". Abraham Lincoln.

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166. " I have learnt at the feet of my mother that there are no rights but only duties and from the duties well done follow the rights". Mahatama Gandhi.

167. "We ourselves feel that what we are doing is just a drop in the ocean. But the ocean would be less because of that missing drop". Mother Teresa.

168. The art of living is more like wrestling than dancing.

169. Life is short, don't make it shorter by wasting time.

170. Each of us is given a pocketful of time to spend however we may . We use what we will. We waste what we will. But we can never get back a day.

171. One is just a fool to reason with a fool.

172. If you want to be avenged, hold your tongue.

173. Be ready to spend to-day for to-morrow's growth.

174. Nobody is good enough to be another's master.

175. Example is not the main thing in influencing the people. It is the only thing.

176. For progress and success in life, there are only two words "Work, Work".

177. The crown and glory of life is character.

178. Worthwhile work is the name of God.

179. You cannot shake hands with clenched fist.

180. Wounds of tongue are deeper than wounds caused by sword.

181. Man is a bridge between the two worlds, the visible

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and the invisible.

182. It is good to think well, but it is divine to act well.

183. Greatness lies not in being strong, but in the right use of strength.

184. Character is man's greatest need, and man's greatest safe-guard.

185. The smell of flower goes in the wind but the fame of a good man goes even against wind.

186. Be like a rose which perfumes the hand that crushes it.

187. None are so empty as those who are full of themselves.

188. " I sleep and see that life is dream. When I wake up I see that life is a duty". Mahatma Gandhi.

189. There was never a night (Problem) that could defeat sunrise (hope)

190. No day in which you learn something is a complete loss.

191. March towards death begins with birth.

192. Virtue is health, vice is sickness.

193. Beauty is truth and truth beauty,
That is all yea know,
And all yea need to know,

194. The moon shines, but the dogs bark.

195. "We have just enough religion to make us hate, but not enough to make us love one another". Jonathan

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Swift.

196. Life divorced from religion, is not human life, it is animal life.

197. He, who is unable to rule over self, can never really succeed in ruling over others.

198. "The problems of victory are more agreeable than those of defeat, but they are no less difficult". Winston Churchill.

199. " I quarrel less with others but more with myself. I can silence crowds but cannot silence myself", Atal Bihari Vajpayee.

200. If spirituality is not the basis of life, we shall crumble into dust.

201. "Chastity is the cornerstone of all morality and of all religion". Swami Vivekananda.

202. There is no elevator to success; you have to take the stairs.

203. The best tranquillizer is a clear conscience.

204. " Life is one eternal struggle between good and evil". Vivekananda

205. Hatred never ceases by hatred. It an only be ceased by love.

206. Your only duty is to realize God, this includes all other duties.

207. A life-time of happiness! No men alive could bear

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it.

208. Resist the devil, and he will flee from you.

209. Hear no evil,
Speak no evil,
See no evil,
Do no evil,
Think no evil,

210. "Slip-shod work is like half-baked bread, fit only to be thrown away". Mahatma Gandhi

211. However great the tide, it ebbs.

212. He who sacrifices his conscience to ambition burns a picture to obtain ashes.

213. A righteous man's concern is to uphold virtue and to wipe out it's opposite.

214. A person who is courteous and generous to a stranger is a citizen of the world.

215. It is difficult to make a name, but it is more difficult to retain it.

216. Earth has no sorrow that heaven cannot heal.

217. Hate binds towards hell as love binds us towards heaven.

218. You will win, if only you think and believe you can.

219. Well begun is half-done.

220. Duty before desire.

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221. Be softer than butter when kindness is concerned

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but harder than steel when principles are at stake.

222. Religion is the best armour in the world, but the worst cloak.

223. There is always the next day.

224. Honest toil never goes unrewarded.

225. Admonish your friends privately but praise them openly.

226. Give the world the best and the best will come to you.

227. Tell me what company thou keepest, and I'll tell thee what thou art.

228. Happiness is different from pleasure. Happiness has something to do with struggling and enduring and accomplishing.

229. Fortune smiles on the bold but frowns on the timid.

230. You can take horse to water, but you can't make him drink it.

231. One of the greatest victories you can gain over someone is to beat him at politeness.

232. "We learn only when it is too late that the marvel is the passing moment". Francois Mitterand.

233. It takes twenty years to build a reputation and five minutes to ruin it.

234. "So long as we have not become truly civilized, we are half animal and half human". Mahatma Gandhi.

235. There is little to choose from rotten apples.

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236. All is well that ends well.
237. First deserve then desire.
238. Thieves leave no footprints.
239. Be lotus in mud
240. To see is easy, but to foresee- that is the great thing.
241. Life never withers if there is a goal.
242. "If all forsake you, God shall still be with you". Mahatma Gandhi.
243. Desperate diseases require desperate remedies.
244. Common sense is most uncommon.
245. What a noise,
    And what a din,
    Is the world,
    That I live in.
246. He profits most who serves best.
247. "It is the sacred duty of the teachers to humanize the present humanity and civilize the present civilization". Dr. Radhakrishnan.
248. The man who never alters his opinion is like standing water and breeds reptiles of mind.
249. Sickness comes on horse and goes on foot.
250. "One must humble utterly and look forward beyond oneself for strength" Mahatma Gandhi
251. Laziness is number one enemy of man.

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252. Hate the sin and not the sinner.

253. If you are good only to yourself, you are good-for nothing.

254. Life is measured by action and not by time.

255. There are no rainbows without rain; there are no victories without pain.

256. "Just as I do not like pain, so does no one else in this world like pain" Mahavira

257. Lives of great men all remind us.
That we can make our lives sublime.
And departing leave behind us.
Footprints on the sands of time.

258. Two men looked out of the prison bars, one saw mud and the other stars.

259. "Truth and love conquer the world" Mahatma Gandhi.

260. "They also serve who stand and wait". Milton

261. There is no crown without a cross.

262. A good friend is more valuable than all the glories of the world

263. Failure takes you one step nearer victory

264. Here hath been dawning,
Another blue day,
Think, wilt thou let it,
Slip, useless away

265. A well spent day earns for us a sweet sleep at

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night.

266. Add love to a house and you have a home.

267. Not gold but only men can make, a people (Nation) great and strong.

268. Better to wear out than to rust out.

269. "To err is human, to forgive divine". Alexander pope.

270. "Heights by great men reached and kept,
Were not attained by sudden flight,
But they, while their companions slept,
Were toiling upwards in the night" H.W. Longfellow.

271. " A truth that is told with bad intent beats all the lies you can invent". William Blake.

272. It is better to lose in the right way than to win in a wrong way.

273. "Some people have food but no appetite; others have appetite but no food; I have both. The Lord be praised!" Oliver Cromwell.

274. The most wasted day of your life is the day when you have not laughed.

275. "Each little flower that opens,
Each little bird that sings,
He made their glowing colours,
He made their tiny wings.

276. The reaction of the world is exactly what you do it.

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277. "One impulse from a vernal wood,
May teach you more of man,
Of ,moral, evil and of good,
Than all the sages can", Wordsworth

278. "Man can overcome mountains by faith". Mahatma Gandhi.

279. Thundering clouds seldom pour rains.

280. No human being is devoid of God's grace.

281. We should pray for a sound mind in a sound body.

282. A teacher can never teach unless he is still learning himself..

283. That which is selfish is immoral, and that which is unselfish is moral.

284. Ill got, ill spent

285. "Ill can he rule that cannot reach the small". Edmund spencer.

286. He that governs others, first should be the master of himself.

287. "A Guru (Preceptor) should be perfect, God alone is that". Mahatma Gandhi

288. An injury is much sooner forgotten than an insult.

289. Pen is stronger than sword.

290. Penny saved becomes a pound tomorrow

291. Justice is truth in action.

292. In the world's broad field of battle.
In the Bivouac of life,

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Be not like dumb-driven cattle,
Be a hero in the strife.

293 The Sun shines upon all alike.

294. The outer and the inner must go hand in hand.

295. Patriotism is not enough. You must have no hatred or bitterness towards anyone.

296. "Woods are lovely, dark and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep, " Robert Frost.
Pandit Jawaharlal Nehru adopted these lines

297. Among a people generally corrupt, liberty cannot last long.

298. "Take away love, and our earth is a tomb", Robert Browning.

299. "Let the past serve the present" Mao Tse- Tung

300. Pure thoughts, good actions, and remembering His name----------is all that is required of you.

301. "There is goodness as well as greatness in simplicity, not in wealth". Mahatma Gandhi

302. Problems bring us together but ideas separate us.

303. Virtue consists in wiping out the wicked. Slay the wicked in a spirit of worship.

304. The desire for pleasure and power is a great barrier to spiritual peace.

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305. If dog bites a person, that is no news.
If a man bites a dog, that makes news.

306. Materialism has man's selfishness as its motive force; spirituality has selflessness as its vital force.

307. Selfishness creates discord, disharmony and destruction, selflessness leads to peace, harmony progress and happiness.

308. "What is hateful unto thee, do not do unto. thy fellow"

309. It is not enough to believe in a God of love but we must love.

310. The rains that make the lower plains fertile are formed in the upper layers of the atmosphere

311. Religions must be cured of their provincialism and made to reveal their universality.

312. Loyalty to tradition does not mean imprisonment within it.

313. The fool cannot be mended by flogging, and he who flogs is the greatest fool.

314. Faith is no substitute for hard work.

315. We can hold that our particular formulation is valid formulation of truth without denying the validity of others forms.

316. Action shaped and guided by fear is no action at all.

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317. Be the abode of kindliness; let your very looks bring peace.

318. You do not want to be hated, therefore hate not others.

319. It is the law of nature that what you give to others comes back to you.

320. Don't ask for a lighter burden, ask for stronger shoulders.

321. "The stupid speak of the past, the wise of the present fools of the future", Napoleon Bonaparte.

322. "Blessed are the peacemakers; for they shall be called the children of God". Mathew.

323. "Patriotism is the egg from which wars are hatched" Guy De Maupassant.

324. Who rises from prayer a better man, his prayer is answered.

325. It is by our quarrels that we spoil our prayers.

326. The childhood shows the man, as morning shows the day.

327. Devotion to duty is the highest form of worship of God.

328. All religions are paths leading to one God.

329. Have the same respect for others religions as you have for your own.

330. The bravest persons are the most forgiving and the most anxious to avoid quarrels.

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331. Strive for excellence in your performance.

332. Offer help before it is asked for.

333. "He who dares not reason is a slave" Lord Byron.

334. "Tis a lesson, you should heed,
Try, try again
If at first you don't succeed,
Try try again, Willim Edward Hickson

335. We know nothing of to-morrow; our business is to be good and happy today.

336. " I have never met a man who has given me as much trouble as myself" Dwight L. Moody.

337. "A thing is not necessarily true because a man dies for it", Oscar Wilde

338. "Work banishes those three great evils, boredom, vice, and poverty". Voltaire

339. "Life is too short for mean anxieties". Charles Kingsley

340. "He alone fails who feebly creeps, he wins who dares the victorious march".

341. "Tell me what company thou keepest, and I'll tell thee what thou art".

342. "Virtue is of the heart and not of the mind. When the mind cultivates virtue, it is cunning calculation". J. Krishanmurti.

343. However securely you may climb, never say you cannot fall.

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344. Force without justice is brutal, but justice without force is vain.

345. It is only by transforming ourselves that we can transform the world.

346. Fortune smiles on the bold but frowns on the timid

347. How things look on the outside of us depends on how things are on the inside of us.

348. "India is immortal, if she persists in her search for God" Swami Vivekanand.

349. He who reproves the lame must walk upright.

350. A fly sat on a moving wheel and said, "Am I not driving the cart?"

351. Rights are snatched, not begged.

352. Lazy are not only those who do not work but those also who do not work as much as they are able to or have the capacity to.

353. Discipline without freedom is tyranny; freedom without discipline is chaos.

354. Healing is a natural; biological process.
We all carry the best doctor within us.
All we need is proper diet, exercise and rest.

355. Pure food (well-earned food) brings a pure mind- and in a pure mind is a constant memory of God.

356. All thought, word and deed require to be directed to the glory of the lord and the good of the world

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357. The doer of good never comes to grief.

358. Between the milling stones, only the grains which stick towards the center are not crushed.

359. There should be harmony in thought, word and deed.

360. With each little good thought,
With each little good word, and
With each little good act, a person reaps a harvest of happiness and peace.

361. We must all crawl (be humble) before we are grown.

362. When egoism goes, all miseries vanish along with it.

363. "Action is thy duty; fruit is not thy concern". Gita.

364. "The Quran states that the prophets were sent to the world as a mercy to the people" Maulana Wahiduddin Khan

365. The two greatest commandments according to Lord Jesus are:
"You must love the Lord your God with all your heart, and with all your soul, and with all your mind. And you must love your neighbour as yourself".

366. "The greatest human achievements of the last few centuries have been principally in the realms of mind and matter. The next stage of human development will be our entry into a global age of love- the cosmic age". Sant Darshan Singh.

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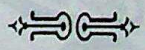
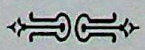
II PRAYER

"O Lord, the refuge of the refugeless and the
Supreme Master of this Universe,
May Good be to the whole world;
May the wretched ones turn into kind people,
May all the living beings wish happiness to one another,
May their hearts be motivated by mutual love and welfare;
And may our hearts turn effortlessly
and motivelessly to thy Holy Feet!"



" I am seeing impossible thing becoming possible through power of Prayer"

Pandit Jawaharlal Nehru



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III POEMS OF SPIRIT

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MOTHER

Your Mother, your Mother
Gives you birth, gives you worth,
Even before birth, protects you
In her womb for three- quarters of a year

She suckles you, nourishes you, cleans you,
Washes you, feeds you, and in her lap carries you.
She delights in your growth and in your movements,
Ready to undergo any hardship for you

She cannot tolerate your ailment or pain,
And nurses you till you are well again,
She never complains even if you wet her clothes or you are a nuisance to her
She cannot bear or hear you cry or weep, remains awake till she lulls you to sleep.

She prays for your well-being and prosperity,
She condones your mistakes and ignores your faults,
Corrects your silly slips of tongue and speech,

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Teaches you manners educates you and in fact the whole family.

Do you love and respect her?

Do you touch her feet every morning?

Do you help her in her daily work?

Do you polish her shoes and seek her blessings?

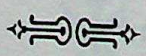
Her embraces, kisses, care and encouraging words bring you up,

Even her harsh words and beating bless you and brush you up,

That is what legend and scriptures teach you.

Do share her burden in some way and obey her, my dear.

"Mother is the name of God
at the lips and in the
heart of little children".



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TEACHER

One good teacher,
Is worth a thousand priests,
As the teachers not only speak through words,
But also through their lives

The teacher is a model for children to follow,
Acts as a friend, a parent, and as a hero,
Teaches you punctuality, regularity & humility,
Builds up your character, manners, morals and spirituality.

Imparts knowledge beyond books
Instills discipline in you, motivates you to undertake adventure and adopt wider outlook,
Gives you physical, mental and all round training,
And teaches you to be friendly to strangers and others.

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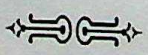
Chisels you as the gold smith chisels gold,
Brings you up for future citizenship,
Gives your life a direction and meaning,
And gives you qualities of leadership.

By soft and kind words and example,
Makes you discover your path,
Of research, practical work and reasoning,
Develops in you kindness to birds, animals and to your fellow- beings

Do you respect him? Do you obey him?
Do you ask him questions for clarification?
Do you understand him? Do you love him?
If he happens to pass by you, do you stand at attention?



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INTO THE TWENTY-FIRST CENTURY

We are stepping into the 21st century in a year,
With considerable achievement and pride,
The burning and torture of widows and degrading girl child.
Slave trade, apartheid, casteism and dictatorship are all left behind.

Dark ages of imperialism, colonialism, exploitation and autocracy,
Are, by and large, all waning and away,
Human mind has evolved with lots of wonderful inventions
Of atom and electric energy, transport, telecommunications,
Space probe, internet and computers

There is global awakening, regarding better employment, and food production,
Poverty eradication, healthy environment, and education.
More of living as brothers and letting live others, democracy and cooperation,

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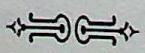
Greater trade and travel interaction, wealth distribution.

Better ways of farming; medicine, health and child-care,
Better methods of refuse disposal, housing and architecture,
Mechanical methods of cooking, washing and manufacture.
More comfort, speed and elongation of life, due to advance in science and culture

People have to be cautious in the next century, however,
They have to prevent overpopulation and eliminate child labour,
Control weapons of mass destruction, especially nuclear,
Must respect all religions, stopping narcotics and all kinds of terror.

There is to be moral rearmament and stress on healthy environment
Necessary to eradicate violence and corruption and evolve trade globalisation,
Among diverse cultures, there should be more cooperation;
In spite of differences in human colours and civilization



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SCIENCE AND RELIGION

Science and Religion have to go together,
To make a person heathy, wealthy, and happier.
Science, the knowledge of universe gained through experiment and observation,
And religion, the knowledge about Supreme, gained through prayer and meditation

The two are the pillars supporting the human being completely,
And are in no way antagonistic to each other but complementary.
Science establish universal laws, leading to discovery and invention to enrich humanity
Religion, sans rituals, is compassion, love, brotherhood, truth, leading to service of mankind and humility.

A man of science is a man of religion and vice-versa,
Both make a man hardworking, honest, humble and helpful to all without distinction.
Both civilize and develop a person of character,
Both bring out the best qualities in a person and make him of respectable nature.

Science teaches man true reasoning and rids him of superstition,

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Religion creates faith in supreme leading to self-realization.

Science is Mathematics, Physics, Chemistry, Biology, Astronomy.....

Religion is Islam, Hinduism, Buddhism, Christianity,.....without orthodoxy.

"Religion without science is blind,
And Science without Religion is lame" according to Einstein.

Both should be attained in life,
To live comfortably on earth and in heaven

"Take in fresh air, pure water and balanced food". Science says,
And Religion teaches, "Share some of this air, water and food with others."

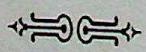
Science has discovered atomic energy to develop electric power.
Religion makes a person sober, develops self-strength so as not to use this atom for destruction of his brother.

The two provide physical and mental comfort and safeguard man from all evil, developing him into an angel

Science teaches to reason out things before adopting new ideas and to reject superstition and orthodoxy,

Religion teaches to pray with heart to realize God and, for the welfare of all, to do one's duty vigorously.

Both are search for truth and serve for the elevation of mankind ultimately.



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AND WE LAMENT AT WHAT HAS HAPPENED

When brothers have turned enemies,
Friends have stabbed at the back,
Students do not listen to teachers,
And depend on cheating in exams,
And we element at what has happened!

Sons have deserted, or defied parents,
And neighbours have turned spies,
Relatives have lost all love,
While teachers have spread lies,
And we lament at what has happened!

People are unkind to birds and animals,
They have turned forests into deserts,
Streets into garbage pits,
And rivers into polluted drains,
And we lament at what has happened!

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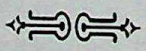
Bigotry has replaced reason,
Violence has replaced love,
Atmosphere smells dust and blood
And foods are adulterated,
And we lament at what has happened!

Prayer has become cloak to cheat people,
Sloth and sluggishness have replaced hardwork and action,
Bribes have polluted various homes,
Politicians and bureaucrats serve their own purposes,
And we lament at what has happened!

To prevent further deterioration,
Come to senses, dear people,
Life is action meant for welfare of all,
And to prevent evil,
Then we shall lament no more!



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POINTING AT OTHERS

Most of us find fault with others,
With relations, neighbours and strangers
But consider our own selves
Great, honest, without any blemish and faultless

In this self-flattery and gossip, we pass,
Almost the whole lifetime, days, weeks, months and years.
One complains, "Oh! so and so is miserly, unworthy,
Haughty, cunning, unhelpful,!" And the other nods
His head in agreement, adding more adverse adverbs and adjectives in the process.

We are actually pots calling kettles black,
By discrediting others, we feel superior,
And for the time being, derive undesirable pleasure.
But, in fact, our remarks rebound and recoil,
Our mind gets polluted and thus we distance ourselves from the Superior

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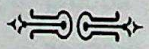
Not only do we criticize all kinds of characters,
But often derive pleasure in the sufferings of others
This attitude exhibits our lack of love and shallowness.
There is always some good in others, which we knowingly fail to discover

We forget that if we point forefinger towards somebody,
The other three fingers are pointing towards us.
Reminding us that we should correct ourselves,
Before trying to correct or speak ill of others.

Let us only give good example of behaviour of ourselves,
Without ever picking holes in others,
Instead, we should for all use encouraging and kind words.
And then we are sure to hear kind echoes



"No human being is devoid of God's grace".

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TEACHERS NOT TRADERS

Dear teachers, you are civilizers and character-builders of people all over the globe.
Do not go astray forgetting what role you are destined to play.
Do not mind if you are materially poor, and you don't attract due esteem and honour.
You are sure to be at the top of society, sooner or later.

All economies and progress depend on what and how you teach and direct your students
You can transform a poor, backward country into a rich and civilized country.
You can convert a rough student into a humble and helpful one,
It is not the mushroom growth of schools that can educate a nation,
But in such schools your active role and participation.

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Do you make your lesson so interesting that no student can afford to remain absent in your period?

Do you complete and revise the syllabus in the stipulated time and term?

Do you use Harbartian steps while delivering the lesson?

Do you while teaching the lesson use any illustration, chart, diagram, map or an experimental demonstration?

Do you encourage students to ask you genuine questions about your lessons?

Do you go sufficiently prepared to be able to answer cheerfully such expected questions?

Do you encourage students to study extra in library or experiment in laboratory?

Do you motivate and guide brilliant students to do further project work, research and investigation?

Do you check note-books, test-books, laboratory work properly, and correct the mistakes periodically?

Do you try to remove the failings, flaws and superstitions of your students?

Do you make sure that majority of your students do not need private tuition in your subject?

Do you spiritualize the lesson by explaining a quotation about goodness, good-manners, brotherhood, truth, courage, service to fellow beings and kindness to animals?

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Do you take part in games along with students?
Do you demonstrate and correct various movements of children in drills and P.T?
Do you lead children on camps, excursions and expeditions?
Do you help in any other co-curricular activity?

You have to be an example and model to your students.
You have not only to teach by talk and chalk but by your lives.
You have to be sincere, earnest, vigorous, dedicated and even camouflage your own failings.
You have to use kind, sweet and correct language and avoid corporal punishment.

No principal, headmaster or inspector need correct you.
You are the architect of humans and have to use your own conscience, method and ethics to develop and model children,
Into right type of students who should have no hatred for any one.
You have to treat all children as you would treat your own child.
You have to be an all rounder, and build body, mind and soul of those under your care,
You are teachers, not traders, God bless you and your great endeavour

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A STANDARD SCHOOL

A standard school spreads knowledge and develops character,
Caters to all round development of children rich, middle class and poor.
Develops health in their body, poise in the mind and beautitude in their soul,
Through activities physical, mental and spiritual.

For physical development school curriculum includes
Mass drill, PT. acrobatics, athletics,
Short and long distance races, broad, high and hop-step jumps,
Crossing hurdles, obstacle races and gymanstics.

And aquatics- swimming, diving and rowing,
Week-end excursions, adventure courses and summer hiking,
Mountaineering, winter skiing and camping,
Planned games for all in school grounds, in the morning, afternoon and evening.

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Games include kabadi, hockey, soccer, cricket,
Volley-ball, table-tennis and badminton.
In such games, school arranges inter-house and inter-school competitions,
Through which children develop physique, courage, comradeship, leadership and fearlessness

For mental development, regular class-teaching by dedicated teachers,
And side by side, laboratory work for juniors and seniors,
Extra work through library, science exhibitions, projects, demonstrations and computers.
Continuous maintenance and correction of note-books and evaluation of work though monthly, quarterly and annual tests.

Besides varied co-curricular activities for all age-groups,
Recitation, declamation, debates, dramas, group discussions,
Art and music, N.C.C., Scouting, hobbies and clubs,
Regular general information tests and quiz produce excellent future citizens

For spiritual development, the standard school arranges regular assembly prayer,

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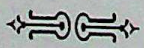
And visiting the homes of the needy, the sick,
Carrying medicines to the lepers
And fruits, flowers to such people by children themselves.

Arranging some kind of social service in the neighborhood villages,
Occasional moral lessons about good manners, kindness to animals and birds.
The children cooking, eating and sharing food in camps and excursions,
Displaying their achievements in games, drills, projects, models annually to visitors and parents.

The Standard school will thus produce healthy and good citizens to serve their country and humanity,
They will have fellow-feeling, be merciful, honest and help society.
Whatever position they occupy in life, they will fulfil their duty vigorously.
And bring credit to parents, teachers, the school and everybody.



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SUN

Sun gives light to be able to see around and read and write.
It enables green plants to make starch to grow and look bright.
Sun gives warmth to land, air and sea
It evaporates water to produce clouds and rain,
Sun produces seasons, summer, winter, autumn and spring, as
Earth revolves round it,
It produces day for work and night for sleep as
Earth rotates in front of it.

Sun melts snow on mountains to feed rivers,
Germinates seeds into plants by this water and its warmth.
Sun thus grows our food, fruit, vegetables and flowers,
Sun produces wind energy to work mills to grind flour
And produces electric energy.
Sun's melted water dropped from height rotates turbine
To generate hydroelectricity

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Sun is the source of energy in fossil fuels, coal, petroleum and natural gas,
Through the biomass of dead plants and animals under the earth over millions of years,
Without pollution, work our solar cookers, solar heaters, solar cells and solar power plants
Directly or indirectly sun supports life,
And is the source of all types of energy.

Sun sheds a lot of sunshine in our country during the year,
So that we can grow a lot of crops and foods and have plenty of water,
In parts of the world like England, people thirst for sunshine,
And can hardly grow just potatoes and dry salt from brine,
If, by chance, it is bright sunshine someday,
They call the day, "Indian summer day",
And bask on the sea-beaches in mirthful way.

Thank God, sun has shone for millions of years,
By nuclear fusion of Hydrogen atoms into Helium ones,
It is going to shine for millions of years yet more,
Before it gets replaced by another sun as a new-born star.

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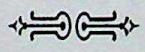
It is the nearest star to us yet very far.
It produces heat and light by fusion without pollution

Sit alone and rest in sunshine under a shady tree for some-time,
You can communicate with the unknown and have a glimpse of infinite skyline.
At the same time, tree will teach you to bear the heat of the sun.
And give shade to those under you and your relation.
All blessings come to you through the sun,
Which is god, all light and no darkness.
Do bow before it daily to pay your gratitude and feel your smallness.



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OLD AGE

Old age is the winter of your life,
When Physical strength diminishes steadily,
Your tooth aches, blood pressure rises,
Sugar appears and your body is weak and lean generally.

Your vision blurs, memory fades,
Your power of digestion weakens,
You eat little and your speed of doing things immensely decreases,
For support you may need a walking stick and hearing-aid for ears.

However, your wisdom sharpens,
And you reminiscence the past,
You are mellowed down and subdued,
And your advice is sought.

Your soft words carry authority,
you pray for everybody,
As your relations, friends and foes
seem alike to you and they too love you truly.

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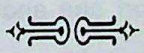
You are the head of the family
You are given the highest esteem thereby,
Your pure love and words of prayer,
Strengthen and divinise your progeny

In this stage you exhibit the role of an ideal human,
Giving your experienced advice and suggestion,
As head, you act as an umbrella
To protect the inmates from heat, rain or any dilemma.

What a great stage of life!
When you are respected and loved:
And you are ready to merge your little self
Into cosmic self after your long journey and strife.



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WELFARE STATE

A welfare state is where people are righteous,
Where people enjoy legitimate rights along with responsibilities,
Where majority and minorities live in peace,
Sharing each others joys, sorrows and festivities

No one suffers from affliction of any kind,
There is justice and divinity all round,
People love and support one another, each following ones prescribed duty,
Reigining everywhere is compassion, charity, truth and purity.

Democratic government is elected by absolutely fair elections,
Representatives are men and women of calibre and character,
Chosen not on caste or communal grounds.
Head of the State is efficient, spiritual, honest and fearless,

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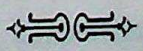
Who will again appoint Heads of Departments, and in key positions, persons of integrity and worthiness.
In the Welfare state there is child-care, respect for women and the aged,
Atmosphere is crime-free, healthy and the surroundings clean,
Cultural activities go along with wide-spread education,
Sports of all kinds are competed with vigour by the youth of the nation.

There are no signs of poverty or exploitation,
All sectors, farming, industry, business and communication,
Banking & foreign trade flourishing with economic liberalization
Food milk, fuels, electricity in plenty for all countrymen.

Governance of the government is without fear or favour.
No official is suspected to be corrupt, inefficient or inferior,
Working with zeal, dedication and fervour
For all people irrespective of creed, community or colour.



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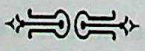
HEALTH

A few rules for health, as health is wealth,
Daily exercise in fresh air inhaling long breaths,
Keeping skin, teeth clean with proper rest and sleep,
Taking balanced food with vegetables and fruit,
Avoiding substance abuse, pollution and contamination,
Meals at fixed times and drinking pure water.
Keeping straight posture and surroundings clean,
Discharging duties meticulously and regularly,
As the movement of planets without any tension.
Keeping good character and avoiding hate or anger,
Everyday prayer and your health is cent percent sure.



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DEAR KASHMIRIS

Why are you deviating from your Kashmiriat,
And age old Sofyana temperament?
Your Motto to help and love mankind
Should not suffer a jolt on any pretext.

We know Allah is neither a Musalman,
Nor a Hindu, a Sikh or a Christian.
He has no particular label
Except that of Rubul-almin

We have accepted Allah as our father
It follows that man is our brother,
Natural environment of Kashmir is His garment.
Why spoil this land, His dress with blood stains and violent dust?

Recover from temporary derangement,
Surely you will come to your own.
That is the will of Rishis and saints,
Of Batmol, Reshmol, Sheikh-ul-alam, Lal Ded and Nundbon.

You are innocent, simple and straight,
Outsiders should not mislead you,
I know you cannot be cheated forever,
As I have been your science and moral teacher.

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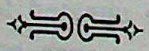
Gandhiji in darkest days of partition,
Found the only ray of hope in Kashmir,
Let us with all our earnestness,
Rekindle that kiran of hope and development

Youngsters, gird up your loins, build your state,
Materially, mentally and spiritually,
Revive that atmosphere of peace and tranquility,
When womenfolk could visit shrines of Muqdam Sahib
and Parbat at midnight freely.

Repression and bigotry cannot exist in the paradise
on Earth,
Brotherhood will replace fundamentalism eventually.
But why not try to hasten to bring back good times,
In our own lifetime?

My dear old boys, wherever you are,
Wake up and guide the innocent Kashmiris,
Lest the posterity curse me and you,
In the twenty-first century.

Kashmir is the crown and glory of India, in fact' Paradise on earth'. It is the laboratory of secularism, brotherhood and cosmic love, the path shown by its saints, sages and rishis. It is the duty of present generation to preserve and improve upon its age-old tradition of amity, holiness and spirituality.



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GOOD MANNERS

"Manners maketh a man". remember this everyday
Good manners start with, "Good morning Papa/mummy"
As you wake up from bed early,
And bowing before them humbly,
Polish their shoes as well as your own daily,
And thus begin to be serviceable at home in someway.

Be loving to your brothers and sisters,
And respectful to the elders,
As you reach school, greet your teachers.
Do not run past them but slow down,
To stand as a mark of respect to superiors.

Without pushing remain in queue at bus-stops
Or at booths to get your turn without fuss,
When you ask for something use, "Please",
And when you receive it, say, "Thank you", always
If you make a mistake unwittingly,
Say, "Excuse me" or "Sorry" invariably,

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Before entering into another's room
Knock and say, "May I come in sir or madam"?
Maintain punctuality at all costs,
And keep your promise and appointments.
Take food without wasting it, asking for
Helpings politely when at parties.

Take care of school or public property,
Put any waste or littler into a dust-bin carefully,
Keep yourself and surroundings clean and tidy.
Do not pollute river water or air deliberately.

Never shout but use soft, polite and kind words,
Use "Mr. Mrs, Sir, Madam" while addressing your seniors,
Wear suitable dress at proper places and at proper times.
In this way exhibit your civilized behaviour and good manners.

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ACTS OF KINDNESS

Acts of kindness bring you satisfaction and make you happy,
It may be giving a little money to a poor person by way of charity,
Offering a glass of fresh water to the thirsty.
Sharing your food, or any comfort with the needy

Giving your seat in bus to an old man or lady,
Helping a child, an old person or a blind man to cross a road carefully,
Lifting or carrying some load for the weary,
Directing a stranger to his destination politely.

Removing broken glass or banana skin from the pathway,
Giving some kind of first-aid to the needy,
Carrying a sick person to a hospital or a dispensary,
Helping your neighbour in someway, say in purchasing or letter-posting.

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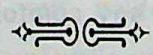
Extending your love to birds and animals,
Never torture them but carry the sick ones to veterinary hospitals,
Water the dry plants and flowers with your hands
Plant a shady tree yearly and set right the fallen creepers.

Give an encouraging word to a person in mourning or distress,
In times of a disaster, volunteer to render service,
Help the illiterate to be able to read and write,
And forgive and forget any harm done to you as an act of kindness



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A MAN OF RELIGION

A man of religion is a complete person regarding behaviour and character
Is a selfless person of values, compassion, humility, love and honour,
Is serviceable, truthful, devoted to duty and always in prayer,
Whether he follows Islam, Hinduism, Christianity, Buddhism or any other faith, creed or colour

Such a person has self-control and love for all beings,
One can easily recognize him by his sincere words and doings,
He is devoted to God at all times-mornings, daytime and evenings,
Material abundance does not detract him from his moorings

Such a person always performs meritorious work,
Earns by honest means and utilises the earnings for his good and for the good of the world
He does not give in, if faced by hardship of any kind,

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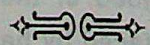
He has perfect harmony in thought, word and deed.
A man of religion grieves to see others in distress,
And rejoices at others joy and progress,
Such a person gives honour to all and is himself modest and almost guiltless.
He has conquered anger, hatred, greed lust, being abode of dispassion

People in turn respect and love a man of Religion and are drawn towards such a person, be he Hindu, Muslim, Buddhist or Christian.
For his goodness, kindness politeness and devotion,
For his being balanced in success, failure, anger or emotion,
People flock to get his sincere advice and divine vibration.

You may call such a person a saint, a sufi, a rishi,
Or a benefactor, a good friend, a noble brother simply,
You would like to follow his example earnestly
For your own good, divinity and prosperity

A man of science is almost similar to man of religion
He is also absorbed in the pursuit of truth and invention
For the benefit of mankind, never minding success or failure.
He is modest, helpful, indispensable, charitable and commands respect from world over.



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ANIMALS AND BIRDS

Kindness to animals and birds is recognised world over,
We have never to beat or hurt an animal, and never to tie their necks with tight collar.
We have to provide them food, water and hygienic shelter,
And even the birds are to be provided, at a safe place everyday, with grain and water.

Our life is not possible without the support of animals,
For example cow gives milk like mother to us,
Milk is the balanced food for human beings of all kinds.
Cheese, cream, butter, ghee and sweets,
Made out out of milk contain useful proteins.

Cow-dung is useful and dependable fuel to get bio-gas,
It is smokeless fuel of high calorific value,
Easily to replace conventional fossil fuels,
Which will get exhausted in near future.
Spent slurry from bio-gas is good fertilizer for farmer's land.

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Buffaloes plough our fields to grow crops,
Small pox vaccine is made from cow-pox,
We wear comfortable shoes from animal skins.

Never slaughter animals for food,
As there are plenty of alternate vegetable foods available from motherland,
Get vitamins from green leafy vegetables and fruit,
Proteins from milk, pulses and gram,
And fats from butter-milk and cheese.

Animals and birds need our utmost attention and kindness,
Do protect them all for our own economic needs.
Animal foods for a hot country like ours,
Are going to be dangerous and cause sickness

From butterfly to an elephant, Man derives help and pleasure.
The dog keeps watch, the horse carries load, the animals give even their skins to wrap humans.

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WHY BOTHER?

Why bother if there are different shades and shapes of people about you?
The white, the black and the wheatish are different facets of the same spirit that is in you,
Do enjoy the basic unity in diversity,
And come closer to life's goal of peace and tranquility.

Why bother if vocation of different persons in different?
May be some are traders, some soldiers, some workmen and some farmers,
Do respect them all if only they have good manners,
And are honest dealers.

Why accuse falsely that a Punjabi is rough,
A Kashmir coward, a Gujrati miserly and so on?
There are people of good and bad qualities in all communities and regions,
Why bother to nickname, only try to associate with open heart with all.
You will derive joy as you find good qualities in them all.
Why bother where a person worships, God, in a church, mosque, monastery or a temple?
And why bother how a person prays to God, by reciting the Bible, the Quarn, the Granth or the Gita,
Silently, by singing or loudly, jointly or singly,

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The purpose is to reach Him somehow humbly.
Why discuss how a dead body should be disposed of- by cremation or by burial?
These debates will lead you no where,
But only far away from God!
The world is coming so close that
You cannot live in isolation,
But as one among numberless souls.

To think of ones own place of birth, country faith is genuine,
But you have also to be the citizen of the world in order to attain true emancipation
To bother only about the welfare of your own family, own relation, your own caste, creed, language, dress and region is not spiritual,
You have to love all mankind and share customs, culture and good way of living of all to derive maximum benefit and divine pleasure.

You have to lead a simple, pure, disciplined and dignified life,
To be able to benefit society and work towards healthy world order and peace
You have to widen your outlook, learn to live with the person you meet;
You purify your thoughts and bother only to reform yourself.
So that the other person gets induced to be kind and humane,
And then you are, all set to meet God!

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INFINITUDE

Imagine the infinitude of the vast space round the earth called the Universe!

The tiny speck of this Universe is our solar system, the sun and round it the planets,

There are billion and billions of Suns (called stars) in the universe.

Astronomers estimate that the universe contains some hundred billion galaxies,

Each galaxy on an average has about hundred billion stars!

These stars are separated by vast distances estimated in light years!

One light year is the distance covered by sunlight in one year.

The light travels 300,000 kilometers in one second, and so nearly $\frac{13}{10}$ kilometers in a year.

The nearest star is $4.3x\frac{13}{10}$ kilometers away from us - the staggering measure.

The stars even in daytime are where they have always been, up there in the sky above us.

The stars and the moon cannot be seen during the day because the sun's light ismuch brighter than theirs,

The sun at night is in exactly the same place as it is

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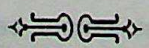
during the day,
It is we who move away from the sun because the earth spins round its own axis.

The volume of water in oceans is tremendous,
Each gram of water it is estimated contains $3x10^{22}$ molecules,
The bottom of ocean contains hills and mountains,
There are countless birds, insects, fishes and plants,
And countless leaves growing on trees!

There are millions of cells that make our body!
And countless pores on the skin invisible to eye.
There are infinite atoms in matter containing tremendous energy,
And infinite particles of sand in a desert,
Also staggering varieties of animals from amoeba to elephant,
And beautiful varieties of flowers, eatables and fruits.

The numbers are infinite and who governs this infinitude and the movements of planets?
The answer is the Supreme Almighty God.
Each person is to try to understand and get a glimpse of His infinite glory,
Through extreme cosmic love for Him and His infinite creation and through humility!



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YOUR FAITH AND GLOBAL FAITH

It is good and only proper to follow one's faith, truly, faithfully and innocently,
And pray to God in the manner prescribed by your faith, heartily,
Earnestly without any show off and artificiality.
You will reap happiness, peace of mind and joy surely.

Your faith followed faithfully will make you an honest and fearless person,
It will make you good to all without distinction,
Make you respectful to elders and truthful in transaction,
Make you do your duty with passion,
Make you love God and His creation.

And the qualities imbibed through your faith,
Will lead you to global faith.
To tenets of all great religions,
To compassion and to help the needy,
To mercy and forgiveness even to your enemy,

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To non-violence and toleration, for any difference of opinion,
To straight-forwardness and fair dealings with your companion, man and woman,
And fair treatment to animals, domestic or wild, stray or pet.

Ultimately the purpose is to achieve true happiness,
And the way is to work hard through your faith and global faith,
So that you are a fit person to live on earth,
Without exploiting the other person who mayhave a different place of birth,
Serve Him, your neighbour and mankind,
Through your good actions and standard behaviour.

You have to free yourself from the prison walls of narow mindedness,
And then breathe in the pure free atmosphere of universal oneness,
Have respect for all religions,
Not superficially but with whole heartedness,
See God everywhere and serve Him in all, with good intentions.
All good people have to accept unity in diversity,
Nature presents this everywhere and universally,

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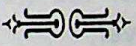
Features present everywhere and at all levels are godly,
You have not merely to tolerate other man's faith, but accept it as your own,
And share joys and sorrows of each other frankly,
This will lead to a happy tensionless world of oneness,
You will be an important individual and the world will be your family.



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TOWARDS PERFECTION

Shed hatred, Shed Anger,
Shed Lust, Shed Greed,
With no duality but cosmic
love for all and forever,
will lead you to perfection
above all creed.

Action is they duty, fruit is not thy concern
Working through love,
and passion for truth,
And with tremendous energy
fight evil, till your goal is achieved
Aand end is reached.

Your dedication to duty,
will merge you in godhood,
your ego then surrenders,
and pure consciousness persists.

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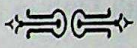
Intense activity,
without attachment or greed
Creates no weariness,
like the unselfish river,
which is active till it,
reaches the sea,
your good work will lead you,
towards God imperceptibly but surely.



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YOUR CONSCIENCE

Honour that streak of Hope that shines,
Sometimes in your conscience that predicts,
That you may turn to be a great personality of substance and holiness,
By doing your duty with faith in God and by spreading kindness.

Respect your parents and honour your teachers,
Respect all women-sisters, daughters, mothers,
Aunts, nieces, as also brothers, uncles,
Relations, neighbours, strangers and others.

Be soft and helpful towards your companions,
But hard towards evil doers,
Fight the evil up to your last breath, my dears,
Never lie or cheat or bring discomfort to your nears or strangers.

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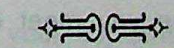
Beware of cheaters and mad dogs,
These may come in your way sometimes,
Never have company with such people and time-servers,
Be pure, simple and straight and shine like lotus in muddy waters.

Maintain equanimity in sorrow and pleasure,
Say, always and in all seasons, sincere prayers,
And keep doing service to all and sundry,
That will bring you nearer God and reward you abundantly.

Never get tired of doing good,
Never give quarter to pensive mood,
Be cheerful in all circumstances
Even when you are nearing the end of your long journey,
God bless you and the kind of you,
Who pay heed to conscience, the God within you.



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BALANCED DEVELOPMENT

Dear young persons, boys or girls,
The more you grow, the more virtuous you have to become,
As you grow in knowledge, you grow in wisdom.
The more proficiency you gain, the more you should gain in manners,
Your growth has not to be lopsided, but balanced.

As you pass one test after another, semester by semester,
You have to evolve in behaviour,
The more you gain in material wealth, the more you have to become generous.
The more you command the language and your trade,
More gentle and humble you have to be in spreading your cool shade.

Don't worry if someone you meet is quarrelsome,
You have to show courtesy and your magnanimity even to such a person.
Not that you have to give up your principle,
But youhave to show due consideration in order to win and convince such people.

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You have never to be revengeful but always helpful,
You have to keep the pans of scale balanced.
If someone shouts at you, do speak in softer words in return.
You never work in stress, but always in calmness.
As you learn more science, you grow correspondingly in spirit.

The greater you attain materially, the greater you have to attain spiritually.
Economic soundness should remove all your pride and shallowness.
Your gender, caste, regional, communal bias and nepotism,
Have to vanish from your personality with your attainment of true education.
Just as dirt gets removed from clothing after washing.

Suppose you don't adjust economically quickly,
But morally and spiritually it should not take you long to adjust properly,
This will accelerate your adjustment in society,
Your parents, country and the world are to be proud of your great or mild contribution,
Whether you get recognition or not,
Your conscience will attain peace and emancipation.

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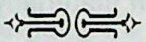
It is you, who have to guide the illiterate and the innocent,
By your balanced reasoning, truth and cosmic love.
Your business and your relationship with others,
Have to be pleasing and gratifying,
In order to make this small world a happy place to live in and travel about,
People round you have to receive vibrations of your sweet conversation and balanced development.



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YOUTH-RIGHTS AND RESPONSIBILITIES

The present youth enjoy -- better facilities of education,
Of experiment and research, of play and recreation,
Better modes of travel and communication,
Have convenient means of growth and living conditions.

Can cast their vote judiciously to shape the destiny of nation,
Have freedom of speech and religion,
Have better means of progress in Gandhi's land of freedom
Can work hard to attain their place of aim & ambition.

Have better facilities of library, reading rooms to study books, magazines & newspapers freely,
Can work for longer hours due to pollution-free lighting arrangement generally,
Radio and television programmers can sharpen their capability,
And are better looked after to face the world squarely.

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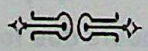
Hence the youth must shoulder responsibilities with greater zeal correspondingly,
Should support parents and elders in the Indian tradition accordingly,
Have to live with their neighbours cordially,
And respect difference of opinion and faith willingly.

Should fight evils of nepotism, corruption,
Pollution, drug-abuse and adulteration,
Be willing to pay taxes for the welfare of nation,
And obey the laws of sacred land and control population.

Have to share their food and facilities with others,
Have to be polite and courteous to stangers,
God bless our youth, the future hope and nation-builders,
Saviours of our civilization, pillars of the country and its defenders.



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YOUR EARNING

Your earning, your earning should be clean and pleasing,
It has to be through hard work, through right means & through devotion to duty,
It should involve no exploitation, no bribes but job satisfaction and sincerity.
This will win respect, honour and peace of mind surely.

Money earned through unfair means is bound to make you uneasy,
Money earned through fraud, gives you illness and misery,
Business should be transparent and profits made reasonably,
Cheating, smuggling and black marketing lead you to prison ultimately.

Do obey your inner voice while earning your living,
For your own good and for your progeny,
Never get tempted in mal-practices,
In spite of your occupation being hard and exacting.

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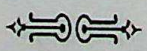
Have faith in your good work and it will bear good fruit,
Besides material gain, you will earn good name,
A sound sleep and no conflict in day to day life,
You will rise in stature in society and in relationship.

You have to set good example for others to follow,
By your honesty and devotion to duty,
Working with zeal through the sweat of your brow,
You have to shine like lotus in surroundings muddy.

It is good to be rich without compromising with falsehood,
Spend hard-earned money judiciously for your own good and for the welfare of neighbourhood
Never waste money in useless pursuits,
But lead a simple, dignified, divine and a hero's life through truthful means.



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DISCIPLINE

As in some developed countries, we must maintain discipline in our lives,
A disciplined nation can achieve strength, greatness and poise.
Discipline does not mean Co-ersion and iron hand due to extreme communism or fundamentalism,
True discipline prevails in secular democratic order, free of corruption and favouritism.

We have to be punctual to the minute in all functions,
Be it attending School, College, Duty, Parties or meetings.
We have to take meals at fixed times and wake up and go to bed punctually,
Even our answer to call of nature, must be regulated at proper times.

There should be discipline in the execution of ones duty,
Remain in queue in order to board a bus or purchase a ticket,

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Be in proper uniform, if required, while in a particular vocation.

And waste not any precious time in gossip, but use time to achieve goal through devotion.

Never take unnecessary leave from duty or shirk duty in anyway.

That is the key to success for you and for the country,

If you have to get redress to your grievance, use peaceful,

Legal and democratic method and never agitational means.

Not only class books, read extra good books,

Magazines and prominent papers with depth.

Through research, invent your own views,

Respect view-point and thoughts of others in an impartial & disciplined way.

Obey the laws of the land to the minutest detail in letter and spirit,

For example, never drive fast but follow proper rules in your mode of transport,

Keep your neighbourhood and environment clean.

Regulate your prayer, studies, hobby, play and rest in your daily routine.

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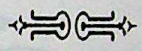
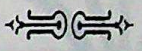
Keep your promises and appointments,
Never cheat or pay or accept bribes,
Pay the required taxes and be ready to help the needy in disaster,
In this way the disciplined people can develop and change the country for the better.



"Discipline without freedom is tyramy; freedom without discipline is chaos".



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IV SPIRITUAL STORIES

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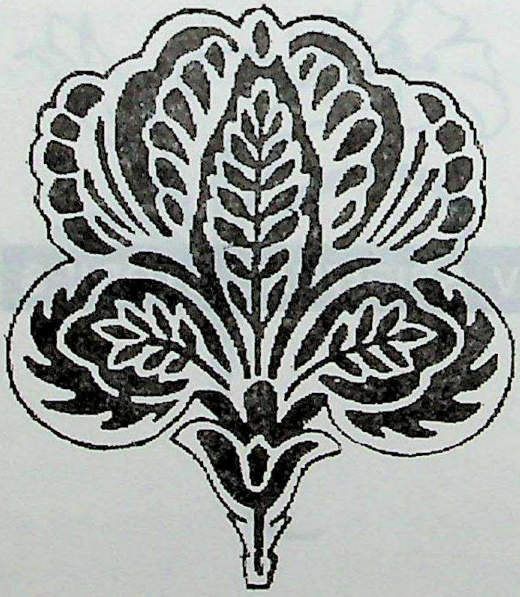

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MIRROR ROOM

A Raja ruled one of the kingdoms in old Rajputana (now Rajasthan) in Medieval India. He was very wise and a generous Raja. He lived in a big palace and the attic of the palace contained a special dressing-room fitted with plane mirrors on all its four walls. The raja would daily visit this room to dress himself, comb his hair, set right his gold-studded turban. He would see a large number of the images of his body and particularly his face in the parallel mirrors and get delighted. Large number of rajas of his image in the mirrors all round would give him joy and he would leave the room reluctantly.

Somehow, one day the door of the dressing-room remained open and his dog happened to enter the room. The dog was surprised to see many dogs in the mirrors of the walls. Being an animal, he could not understand that the other dogs were not real but only his own reflections. He started to bark at them. And the dogs (the images of the dog) barked at him in return. The dog, in panic turned round and round barking towards his own images,

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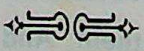
thinking they were different dogs. The dogs in return barked at him so much that the real dog got frightened, had a sudden heart failure and died on the floor of the room. The dog was found dead in the room next morning. The raja being wise understood the cause of death due to ignorance and hatred of the dog for his own images. We have to learn the great lesson from the story that so long as we consider other people living around us as our own images, the same soul living in them, we shall derive utmost joy and live happily as the raja lived among his own images. If we think like the foolish dog and consider people around us different and start hating them (or barking at them) and in return they will hate us causing utmost agony and strife and sadness.

The secret of happiness is to think and enjoy one-ness of humanity and not duality. You have to feel and act in such a way that every other human being is your own image and you have to love and help all those around you and understand and see divinity in all of them. "Love thy neighbour as thyself".



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WHO IS YOUR NEIGHBOUR?

The poor, the needy, the rich whom you meet in everyday life are your neighbours, not necessarily the ones who live next your home you already know. The story of a good Samaritan from the holy Bible illustrates this.

A certain man went down from Jerusalem to Jericho, and fell down among thieves. They stripped him of his clothes, wounded him, and departed, leaving him half dead.

By chance a certain priest came down that road. And when he saw him, he passed by on the other side without bothering to help him. Likewise a Levite, an assistant of the Temple priest, arrived at the place. He came, looked, and passed by on the other side.

But a certain Samaritan, a native of Samaria, as he journeyed, came where he was. And when he saw him, he had compassion. So he went to him and bandaged his wounds, pouring on oil and wine; and he set him on his own animal, brought him to an inn, and took care of him.

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On the next day, when he departed he took out two denarii (a denarius is an ancient Roman silver coin), gave them to the innkeeper, and said to him, "Take care of him, and whatever more you spend, I will repay you when I come again".

So which of these three was neighbour to him who fell among the thieves?

Not so called pious and known ones but one ordinary, unknown, person who showed mercy on him__ the good Samaritan.

We have to be like good Samaritan and help any one, even if unknown to us, consider him as our neighbour and love him as we love our own self.

The story was narrated by Lord Jesus himself about 2000 years ago when a lawyer asked him, "Who is my neighbour?".

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ABOU BEN ADHAM

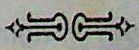
Abou Ben Adham, a great saint, served mankind. He was asleep one night when a dazzling light woke him up suddenly. He saw an angel in front in his room writing something in a book of gold.

"What are you writing?" asked Abou who was bold and fearless. "I am writing the names of those who love God", replied the angel.

"Is my name in the list?" asked Abou. "No," replied the angel. "Please write my name among those who love mankind". And the angel vanished after hearing this.

After a few days the angel again appeared with the dazzling light waking up Abou from his sleep. The angel was holding his book of gold in his hands.

Abou was shown his name at the top of the list of those who loved God"! Love of mankind is love of God". They serve God most who serve his creatures.



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WELCOME TO GOD

The inhabitants of a small town once decided to invite God on an auspicious day to have dinner with them. The representatives of the town met the great saint who lived in a hut in solitude in the suburb. They were sure that the saint would be the right messenger to take their invitation to God in Heaven. The saint listened to them and realized that they had good intentions to invite the Supreme God and agreed to take the invitation to Him on their behalf.

After a few days the saint met the representatives again and told them that God had agreed to dine with them on a day fixed the following week.

The people of the town, young and old, were jubilant to hear the news and started earnestly making preparations to welcome God. The whole town was swept clean and the streets were decorated with welcome arches and red carpets were laid in a particular area of the town to greet God. Special cooks were engaged for preparing a variety of foods for the day in right earnest. No one was allowed to come into the area to cause any disturbance

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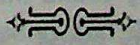
or interference by the managers of the reception committee.

A poor hungry destitude with a shabby dress happened to come that way and begged for a morsel of food. He was immediately shoed out as he was not to disturb the arrangements made for God's visit. The inhabitants waited anxiously for God to arrive and have the meals.

However, they were disappointed not to see God coming, thinking that He did not care for their invitation. They went to the saint again and complained that all their preparations were futile and food got wasted as God did not come on the day fixed for Him.

The saint said that he would go to God and ask Him for not keeping the promise. After one day the saint surprised the people by saying that God had come from all that big distance and was quite hungry but he was not recognised perhaps and thrown out without food being given to Him. God had come in the guise of a poor, hungry and needy person and people and the managers had rejected Him. People felt sorry for not having entertained God who they thought was a poor unworthy stranger for them.

God visits us but most of us are not ready to receive Him.



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THE DEAD MOUSE

In the northern border village of Uttar Pradesh (Terai region) lived one Harprasad, a cloth-dealer with his wife and the only son named Jai Ram. He carried on his little business of cloth but suddenly passed away owing to some fatal illness. The son, Jai Ram, was then studying in eighth class and was left almost a destitute along with his widowed mother. The shop was closed with almost nothing in it as the family lost the bread-winner.

After a few months, mother asked her son to give up studies and make a living by selling cloth as his father did. She advised her son to go to the town and ask for assistance from Seth Govind Das who knew his father. Next day, Jai Ram left for the town to borrow some money for purchasing cloth for the shop from the Seth taking address from his mother. He traced the residence of the 'Seth' in a crowded area with difficulty. He entered the large room in the ground-floor where the Seth was sitting against a pillow.

The young boy found the man talking to another person in a very angry mood. "Why don't you repay my

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debt in spite of my repeated warnings? I am going to file a case against you in the court". The little boy got frightened to see the Seth emotionally upset. However, he took his seat in the dark corner of the big room at a good distance from the 'Seth'. The boy noticed a dead mouse near the corner. The 'Seth' then turned suddenly towards the young boy asking him what he wanted. The boy fumbled and could not give him the true reason of his visit. He simply came forward holding the dead mouse by its tail and said, "Sir, I want to borrow this dead mouse from your room and nothing else". The Seth smiled and let him take the dead-mouse but took from him in writing that he had borrowed the dead mouse from his chamber.

The boy, holding the dead mouse by its tail, went into the street where a sweets-shopkeeper noticed him. He called the boy to give the dead mouse for his pet cat to eat and the boy agreed.

The shopkeeper gave him five rupees and some wheat flour and sugar in return. The shopkeeper was happy that his cat would have a change in its diet.

The boy returned home to his village, purchasing an earthen pot and a few earthen cups with the money he obtained for the dead mouse. He did not disclose to his mother about his meeting and deal with the se[illegible]

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the town. He simply requested his mother to make 'chapatis' out of flour and these he carried along with the pitcher full of cold water to the foot of the forest in the outskirts of his village from where wood-cutters carried loads of wood to sell in the town nearby. As it was hot summer, he offered every wood-cutter carrying wood a cup or two of cold water along with a chapati to eat. The wood-cutters were very happy with the service rendered by the boy and each of them gave a piece or two of wood to the boy in return. The boy collected this wood, sold part of it in the town and carried the remainder to his home to be stored for winter. The boy continued purchasing flour every day for about three months of the summer and serving everyday the wood-cutters with chapatis and cold water to drink.

At the end of the summer season the wood-cutters grew familiar with the kind boy and were very happy with him and each gave him a big load of wood for his services and carried all this wood to his home.

Meanwhile, with the approach of winter, the price of fuel (wood) rose high and the boy sold all the collected wood of summer months at a high price. He was able to re-start his small cloth shop with the large sum of money thus obtained.

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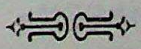
All the wood-cutters and others became his customers and soon he turned out to be a reasonable cloth-merchant selling quality cloth at reasonable price. He was also able to continue the service of giving cold drinking water to the wood-cutters in summer by engaging a servant for the purpose. In a few years the boy grew up to be a famous cloth-merchant (Seth) of the area and a prosperous one. He got made a small mouse of gold from a gold-smith and carried it to Seth Govind Das in the town in lieu of the dead mouse that he had borrowed from him.

The big seth was happy to meet the young Seth and enquired about his welfare. He gave his only daughter in marriage to Jai Ram for being wise, hardworking, prosperous and active cloth-merchant.

And together Jai Ram's business spread under the name Seth Jai Ram Das, Govind Das Textiles and he was a multi-millionaire in a short time. His humble beginning and hard labour bore fruit in abundance-from a dead mouse he rose to prosperity and to a respectable position.



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A JUGGLER

Long ago a juggler lived in Moscow, Russia. He would make his living by showing tricks on the roadside in Moscow streets, earning a few roubles every day. As the winter approached it was getting very difficult to show tricks on the frosty surface of the roads. Very few would attend to watch tricks in the freezing cold at sub zero temperatures. It became very hard to earn his living by showing tricks to the public on roads.

He decided to give up the trade and join a small catholic church as a servant to help the priests of the church in cooking and making tea. The few priests in the church gladly employed him as a servant, and he started helping the priests and in this way he made his living.

But the juggler was not happy because he thought priests were doing holy work daily by praying to mother Mary and writing the holy books for the people while he was quite illiterate and would never aspire to be as great as the priests.

He would see them praying every morning in the church while he was preparing food for them. He had

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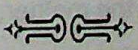
a great desire to win heaven by prayer as the priests did.

After sometime, when the priests would sleep to take rest after prayers and morning lunch, the juggler would attend the church and beg of mother Mary, to forgive him for not being able to pray in the words that the priests would. He would, in right earnest, pray to her by showing his usual juggler's tricks, head standing and other acrobatics to please the Mother.

So every afternoon after serving the priests and seeing them taking rest, he would go to the adjacent church to show his acrobatics with love and humility and sweat out to please Mother. After some weeks, the priests were curious to know where the juggler went after serving them every afternoon. They slowly moved out and through the curtain chinks found that the juggler was busy showing his tricks to Mother who in return would descend forward from her seat and bless the juggler by placing her hand on the head of the juggler accepting his devotional tricks as prayer. His sincerity and simplicity won him immortality where the priests had not been able to win favour from the holy Mother.



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THE OLD JUDGE

A high-court judge of 60 years had an old eighty year mother whom he loved and respected much. After working in the court for the day he would directly come home to his mother and the two together enjoyed the tea and the company. This routine was always followed by the judge and the old mother felt delighted by meeting her son and welcoming him back home daily.

One day it so happened that the judge was taken by his friend to a cinema show directly from the court and the judge just forgot to inform his old mother. While the judge and his friend enjoyed the cinema show, the old mother grew anxious and waited eagerly at the door-steps to receive her old son for about two hours. She was getting worried not understanding that the judge must have had some extra work at the court.

As it started getting dark, the judge along with his friend appeared and the mother, almost mad with anxiety, slapped her son, the judge, in presence of his friend. Tears rolled down his cheeks. The friend of the judge told the

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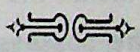
mother that she should not have slapped and insulted the wise judge in this way. But the judge stopped his friend to say anything like that and instead pressed softly and began to massage the hand and the arms of his old mother, saying, "O dear mother, I am happy that you beat me for being late but I am in tears as your hand and arms are so weak now that the slap did not have enough force to set me right. My dear mother, you have grown too weak to produce the same effect as it would when I was a school-going child. I am very sorry to be late. Your beating is a blessing to me". The friend kept silent and appreciated the obedience and love of the judge for his Mother.



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TWENTY FIFTH GENERATION

Quite a rich and prosperous raja lived in a part of India. He had enough wealth and his subjects lived peacefully. Once he called his prime-minister and asked him how much wealth he possessed. The minister was very wise and sought some time to calculate the amount in various treasuries and then he would be able to give the exact picture of his wealth.

After about a month the prime-minister came to tell his majesty that he possessed wealth sufficient for at least twenty-four generations! The raja instead of being happy to know about the tremendous wealth he had, became gloomy and thought within his mind, "What about twenty-fifth generation? How will that generation live without enough money?" The raja was getting unhappy day by day, losing appetite and weight, only thinking about the twenty-fifth generation.

The minister was very wise and somehow understood the cause of his weakness and worry.

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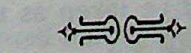
The subjects were asked to pray for the health of the raja. People prayed in temples for the health and long life of their benevolent raja. The minister arranged a great prayer meeting where saints and brahmins were invited to sing hymns and vedic prayers for the whole day and the raja, very weak and thoughtful, was to feed all the saints, sadhus and Brahmins at the end of the day. The raja then moved slowly round the Brahmins and sadhus giving each a coin and a piece of cloth as dakshna (fees) after the feast. As he reached a Naga Sadhu who was all naked, the raja offered him coin and the piece of cloth but the sadhu refused to take it saying he did not need anything as he was naked and required no money or cloth.

The raja was surprised that the sadhu did not care for money or dress even for his survival for another day. The raja bowed before him, threw off his own clothes and crown, became his disciple. All his illness was gone and he lived a happier man without any greed thereafter.



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GANDHI JI'S CLEAN CONFESSION

Mahatma Gandhi was guilty of a theft at the age of fifteen. His brother (elder) ran into a debt of about twenty-five rupees. This brother had on his arm an armlet of solid gold. Gandhi Ji stole a bit of gold out of his brother's armlet. "It was not difficult to clip a bit gold out of it", says Gandhi Ji in his autobiography. On stealing the gold piece, it was sold to clear the debt of his brother.

But the guilt of having stolen the piece became more than Gandhi Ji could bear. He resolved never to steal again. He also made up his mind to confess his guilt to his father. He was not afraid of his father beating him. But he did not dare to speak because he was afraid of the pain that it would cause him. However, Gandhi ji felt that the risk should be taken as there could not be cleansing without a confession.

He wrote out the confession to submit it to his father. In this he wrote that he had committed the guilt

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of stealing and asked adequate punishment for it. He further requested his father not to punish himself for his offence and pledged never to steal in future.

He handed over the note of confession to his father but was trembling. The father was not well at the time and he lay confined to bed on a plain wooden plank. The father read through the note and tears trickled down his cheeks, wetting the paper. For a moment he closed his eyes in thought and then tore up the note. He had sat up to read it and lay down again. Gandhi Ji could realise his father's agony and he also cried.

"Those pearl drops of love cleansed my heart and washed my sin away. Only he who has experienced such love can know what it is", says Gandhi Ji, "This sort of sublime forgiveness was not natural to my father. I had thought he would be angry, say hard things, and strike his forehead. But he was so wonderfully peaceful, and I believe this was due to my clean confession. A clean confession, combined with a promise never to commit the sin again, when offered before one who has the right to receive it, is the purest form of repentance. I know that my confession made my father feel absolutely safe about me, and increased his affection for me beyond measure".

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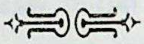
Anyone can make a mistake but confession with a pure and sincere heart can reform a person and make him great, as our father of nation became great by sticking to love and truth.



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TYPICAL STORY OF LIGHT IN DARKNESS

It was autumn time, 1989. The turmoil began. Fundamentalists started sending warnings to ethnic minority to leave their hearths and homes. The Islamic state was to be created. Suneel was getting scared and was enquiring from his friends and associates and also neighbours of the majority community what was happening.

They told him in a hush hush manner that some catastrophy was imminent. He should quit the place for safety. Even the liberal minded of the majority community felt the heat of the fundamentalists approaching them.

They began yielding to their threats and started contributing in cash to get themselves spared out of the impending dangers and violence. Bombs exploded here and there. Innocent lives were shot at to scare out the minority community. Suneel went to his nearest friend, Yusuf, to take his advice about his own safety. Yusuf advised him that he should shift immediately to Jammu or Delhi for a few months. He gave him substantial cash that would

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serve him in exile and also his own taxi along with driver to be used as transport promising that he himself planned to shift his centre of trade temporarily to New Delhi. Yusuf was quite sincere and candid in what he said. Suneel made up his mind to shift along with his family to Jammu. Next morning early he hurriedly packed a few items of his belongings, Yusuf helping him in darkness to pack up the luggage in the taxi provided, and left for Jammu on December 2, 1989 along with his wife and two children.

Suneel rented a few rooms in Jammu to settle for sometime, admitted his two children in a school and got a job for himself in a private company as a salesman. Meanwhile mass exodus of Community was in full swing and the majority community helped them individually, sincerely and silently in every way (like Yusuf) to take shelter away from Kashmir, as the wave of fundamentalist cry of "Jehad" spread.

Yusuf meanwhile, sent regularly money and material help to Suneel so that his friend and Kashmiriat should not suffer a jolt from the difficulties of migration. Yusuf along with his wife and child visited Suneel at Jammu frequently for seven years and saw to it that Suneel did not suffer for want of cash or kind.

Meanwhile Suneel's house in Srinagar was occu-

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pied by militants as a hide out in spite of Yusuf's locks and protection to the house. Yusuf could not manage to keep the fundamental militants out. Yusuf would visit Suneel's house to see if any damage was done to the house.

One day while Yusuf was inspecting the house early morning, a foreign militant suspected him to be an informer, shot at him. Yusuf was injured but he managed to escape. He was admitted into the hospital for the removal of two bullets in his abdomen.

On hearing the bad news Suneel rushed to Srinagar, never minding danger to his life, and stayed in the hospital for a week with Yusuf till he recovered. Suneel was able to bring Yusuf and his wife and young child to Jammu to stay with him till militancy would stop.

The two families are sharing the same rented house now for three years and are waiting impatiently to go back to their place of birth and live together as soon as peace is restored in the valley.

In spite of the violence and terrorism thrust on Kashmir from outside, communal harmony stood the test of time. The communities shared their joys and sorrow even though separated temporarily by some distance. They are exchanging "Id" and "Shivratri" greetings all these years-

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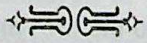
even through the darkest periods, ignoring extremists' threats, This is the peculiar temperament and permanent mark of ethos of Kashmiriat.

The rays of hope are beginning to shine once again in Kashmir when various communities are prepared to live side by side in their own birthplace, continuing their age-old amity, love and inter-dependence. Kashmir, the place of saints, rishis and paradise on earth, is sure to regain its glory and name for friendship, brotherhood, secularism and peace.



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WHOM DOES GOD LOVE MOST?

Narada is a great divine sage of Hindu religious literature and is one of the greatest devotees of God, always singing praises of God Almighty and supposed to be close to God.

On one occasion Narada boasted before the Lord Narayana that no devotee could equal him. But the Lord shook his head in disagreement and said that he loved a particular farmer living in a remote village the most. That farmer was his greatest devotee and asked Narada to see him in order to convince himself.

Narada would not believe that any other devotee could sing the Lord's name as continuously as he did. He got upset and went to the village to see the farmer. He saw the farmer busy with his work of ploughing and attending to farming from dawn to dusk. During this time he uttered the name of the Lord three times only, once when he woke up and started the day's work, second time before taking the mid-day meal in the field and third time before retiring to bed, whereas Narada was going round all the time singing songs in praise of the Lord. Narada rushed back to the Lord Narayana and asked how

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the farmer could be rated as his greatest devotee.

The Lord gave Narada a vessel containing oil filled to the brim and asked Narada to go round and round for sometime and then after a few hours he was asked to stop to check if the vessel was still full and that no drop of oil had spilt over.

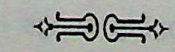
While doing this duty the Lord asked Narada how many times he had thought of or called the Lord's name.

Narada replied that he was concentrating his attention on the vessel full of oil lest a drop should spill and he forgot all about the Lord meanwhile. He admitted his lapse and was very sorry for it.

The Lord explained to Narada, "You forgot me completely while doing this small job of going round with the vessel full of oil. In contrast the farmer does the physical labour intensely throughout the day, yet he has time to think of me at least three times. So, is not the farmer my greatest devotee working tirelessly all the time as also remembering me the Lord. Thus I love the farmer the most".

Narada's ego got a jolt and he was humbled. The lesson from this story is :

"Pray to God and also keep rowing to the shore or doing your duty".



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SECTION B

(SCIENCE)

V Scientific Topics

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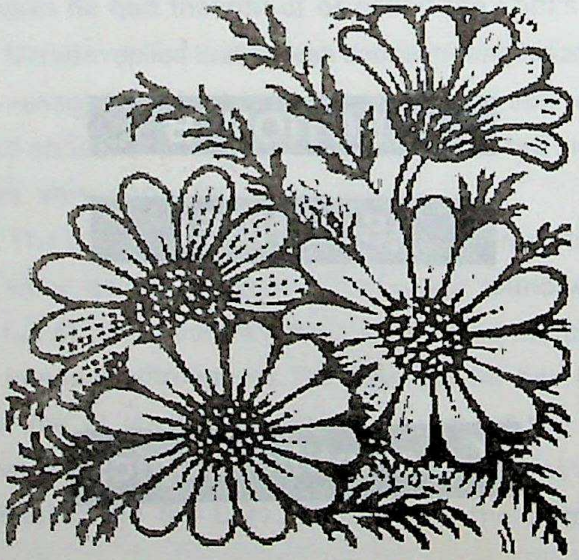

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MATTER

Things around us are matter. Everything that occupies space and has mass is matter. Wood, stones, water, air are all matter. Matter is either soid, liquid or gas. Solids have a definite shape and volume. Liquids (water, oils) have a definite volume but no shape. Liquids change shape with the vessel containing them. Gases have neither shape nor a fixed size or volume. A small amount of a gas can fill a small as well as a big space. Solids have greatest cohesion-intermolecular attraction, while liquids have less cohesion and the gases have the least cohesion. So in a solid molecules are closer together than they are in either the liquid or the gas. When a solid changes into a liquid, the molecules move farther apart and when a liquid changes into a gas, the molccules move still farther apart. On evaporation molecules leave the liquid and on condensation the molecules of the gas move closer together to form back the liquid and on freezing the liquid molecules move still closer together to form the solid.

All matter is made up of simple materials called

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elements, the materials that cannot be broken into simpler materials. An element cannot be split into two different substances. We now recognise one hundred and eight elements. Of these ninety two occur in nature and the rest have been created artificially by man. Every substance in this world is made up of one or more of these elements. Some of the common elements are:- Hydrogen, Oxygen, Nitrogen, Carbon, Sulphur, Phosphorus, Chlorine, Bromine, Iodine, Sodium, Potassium, Magnesium, Calcium, Aluminium, Copper, Silver, Iron, Gold, Zinc, Mercury and Uranium. About 80% of the elements are metals and the remaining 20% are non-metals. Only two elements, mercury and bromine, exist in the liquid state. All other elements are solids or gases. Hydrogen is the lightest element of all. By simply looking at a material we cannot tell whether it is an element. Sand, water, glass and quicklime are made up of two or more elements and are known as compounds. Many thousands of compounds have been formed from the ninety two elements found in nature.

The smallest particle of an element is an atom. Each element has a different kind of atom peculiar to it. A molecule of an element is usually made of two or more similar atoms or may be composed of only a single atom. The molecule of a compound contains two or more different types of atoms. Atoms of most of the elements are very

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reactive and take part in chemical reactions. Such reactive atoms do not exist in the free state. Only the atoms of noble gases like helium, neon, Argon and krypton are unreactive and exist in the free state as single atoms.

Actually masses of the atoms of the elements are very very small. For example one atom of hydrogen (H), the lightest atom, has a mass of 1.673×10^{-24} gram or 0.000000000000000000000001673 gram It is not convenient to use such small and complicated figures. The atomic mass of H atom of the element Hydrogen is taken as one atomic mass unit (1 AMU) and that of carbon 12 units, Nitrogen 14, oxygen 16 and iron 56, and so on. The atomic mass of an element is the relative mass of its atom as compared with the mass of carbon atom (^{12}C) taken as 12 units. All matter is thus composed of atoms.

Atoms are made up of three sub-atomic particles: Elecrons, protons and neutrons. Electron has negative charge, proton has positive charge and neutron is neutral, has no charge. Hydrogen atom is made up of only one electron and one proton. It does not contain any neutron.

An atom consists of a positively charged, dense and very small nucleus containing protons and neutrons. The nucleus is surrounded by negatively charged electrons revolving around it in various orbits at very high speed, just as the sun is revolved and surrounded by planets.

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As the atom is electrically neutral, the number of elecrons is exactly equal to the number of protons. Each atom has a different electronic structure and because of this, properties and reactivity of all atoms are different from each other. e.g., structure of Na atom is shown diagramatically :

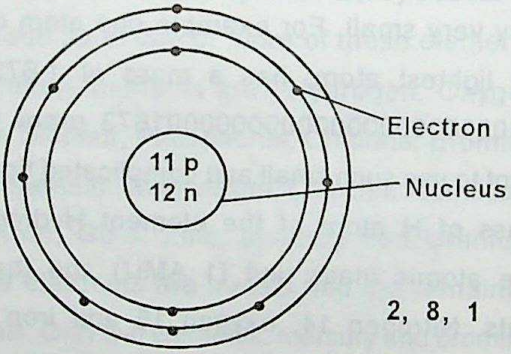

Fig. 1

The outermost shell of an atom cannot accommodate more than 8 electrons.

To sum up all things around us are matter made up of elements which are composed of invisible atoms containing electrons, protons and neutrons. One mole of a substance is the molecular mass of a substance in grams or atomic mass of an element in grams, contains 6.023×10^{23} molecules or atoms. This is called Avogadro's number. For example 1 Mole of sulphur=32 gms contains 6.023×10^{23} atoms and 1 Mole of Water (H_2O)=18 gms also contains 6.023×10^{23} molecules.

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ENERGY

What is energy? We in ordinary terms, say, "He has more energy than any one else in the class". It means that he is always on the move, gets many things done in a short time.

Energy is the capacity to do work. Energy takes a number of different forms. The most common form of energy that man has used over the ages and still continues to use is the energy stored in the muscles of his body. He obtains this energy from the food that he eats. With this energy we are able to do physical work. If we grow weak due to sickness or old age our energy decreases.

The important types or forms of energy are:

1. **Mechanical Energy:** This includes kinetic energy and potential energy. The energy of a body due to its motion is called kinetic energy. Wind has kinetic energy and can turn the blades of wind mill to grind flour. A speeding bullet can damage object placed in its path. The ability to do work based on Motion is called Kinetic Energy.

The energy possessed by objects because of their

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position or shape is called potential energy. An object can also do work by virtue of its position or shape. For example a stone-raised to a height above the ground can do work when it falls. A compressed spring can do work as it expands. The hands of a clock are moved by such an expanding spring. An object can have both kinetic and potential energy.

A stone resting on the top of a hill has only potential energy. As it rolls down hill, it has both kinetic and potential energy. As it reaches the bottom of the hill, it has only kinetic energy.

2. **Heat energy or thermal energy:** The energy possessed in a hot body due to its high temperature is called heat or thermal energy. Heat warms us, changes water into steam and makes steam engine move and performs many other useful functions. The pressure of the hot gases produced by burning petrol-air mixture in the engine of a car rotates its wheels.

3. **Chemical Energy:** The energy produced by a chemical reaction is called chemical energy. The food that we take and the oxygen that we breathe in chemically combine in the blood with the tissues of the body producing energy for us to be able to work.

4. **Light Energy:** Light permits us to see the beauties of nature, read and write. The sunlight enables green plants to make food for growth.

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5. **Electric Energy:** One of the most useful energies is the electrical energy. The flow of electric current in conductors lights our homes, runs our motors and moves our machines.

6. **Nuclear Energy:** The energy produced by fission of heavy atoms or fusion of light atoms is called nuclear energy.

All matter is composed of atoms. Atoms are themselves composed of energy units-electrons, protons and neutrons. It has been possible to break very heavy uranium-235 atoms into lighter atoms of Barium and Krypton producing a large amount of atomic energy. Also, the process of fusing lighter nuclei of Hydrogen into heavier nuclei of Helium produces nuclear energy by fusion. There is some loss of mass during fusion process which produces a tremendous amount of energy. The energy produced by nuclear fusion is much more than produced by nuclear fission.

Energy is useful as it can be changed from one form into another. The potential energy of water stored in a high dam is converted into kinetic energy as it is let fall. The kinetic energy of the falling water is converted into electrical energy by driving electric generators. Similarly, Chemical Energy of coal is changed into heat energy which is further changed into electrical energy by driving the turbine of electric generators by the hot steam. Further

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electrical energy is converted into heat, light, chemical and mechanical energies. Nuclear energy is also changed into electrical energy in nuclear power reactors.

Various sources of energy are :

a) Biomass-cattle dung, wood, agricultural waste-which is a source of heat for cooking etc.

b) Fossil fuels-coal, petroleum and natural gas-formed under the earth by the decay of plants and animals over millions of years. These give us heat energy to run trains, buses, cars, aeroplanes and various machines.

c) Wind and running water produce electricity by turning turbines.

d) Sun gives solar energy which is used in solar cookers, heaters and solar batteries.

e) Nuclear fuels like uranium and plutonium are used to produce electricity in nuclear reactors.

World's all work is done by energy. Our food, our clothes, our transport, our communication, telephone, radio, television, are made possible by various kinds of energy.

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FUEL PETROLEUM

Fuels are materials which are burnt to produce heat energy for cooking food, and other domestic and industrial heating. Our transport vehicles work with fuels and fuels are used even to generate electricity.

Fossil fuels-coal, peroleum and natural gas are formed under the earth over millions of years. These fossil fuels are non-renewable sources of energy. If exhausted, these cannot be regenerated in a short time. These took millions of years to be formed. It will be after another long periods of millions of years that people can hope to find them again. The danger of running out of these fuels can be averted if we exercise great care in using them. These should be used only when no other alternative exists. We must develop technology to use more and more renewable sources of energy like the sun and waste biomas.

Petroleum was formed by the decomposition of the remains of extremely small plants and animals buried under the earth or sea-bed over a period of millions of years under pressure, heat and in absence of oxygen or

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air.

Petroleum is obtained by drilling a hole (oil-well) through the impervious rock under the earth or under the sea-bed. The first oil-well was drilled in Pennsylvania, USA in 1859. Eight years later oil was struck in Assam in India in 1867. Some of the places in India where petroleum is obtained from Oil-wells are Rudrasagar in Assam, Ankleshwar in Gujrat, Bombay High (off-shore area) West of Bombay and in the deltas of Godavari and Kaveri.

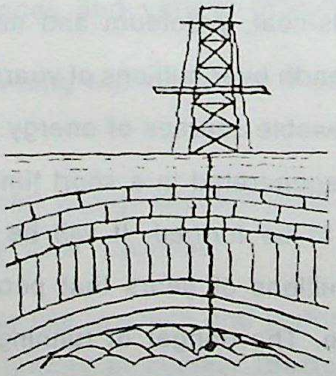

Fig: 2

Petroleum is a mixture of several hydrocarbons and is brown black liquid. It is refined and separated into various useful fractions which have distinctly different boiling points. So, before it can be used for specific purposes it is refined or fractionally distilled.

The crude petroleum oil is heated to a temperature

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of about 400° C in a furnace and vapours thus formed are passed into a tall fractionating tower as shown in the figure. As the hot vapours rise in the column, they cool and separate into various layers (components). The component with the highest boiling point liquifies first at the bottom and is collected. A little higher in the column the component next in line liquifies and so on while the residuel gases escape from the upper part of the tower. The useful components obtained from the base upwards are:-

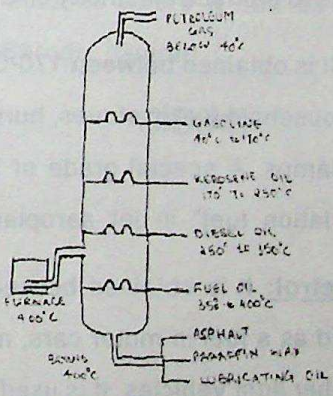

Fig: 3

1. **Asphalt:** It is black sticky non-volatile substance used for making road surfaces.

2. **Paraffin wax:** It is used for making candle, vaseline, ointment and wax paper.

3. **Lubricating oil:** Its boiling point is beyond 400°C. It

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is used for lubricating machinery.

4. **Fuel Oil:** It is obtained between 350°C to 400°C. It is used as a fuel to heat boilers and furnaces in industries. It is a better fuel than coal because it burns comletely and does not leave any residue.

5. **Diesel Oil:** It is obtained between 250°C and 350°C. It is used as a fuel for heavier vehicles like buses, trucks, railway engines and ships. It is also used in diesel generators to produce electricity on a small scale.

6. **Kerosene Oil:** It is obtained between 170°C and 250°C. It is used as a household fuel in stoves, hurricane lamps and petromax lamps. A special grade of kerosene oil is used as "aviation fuel" in jet aeroplanes.

7. **Gasoline or Petrol:** It is obtained between 40°C and 170°C. It is used as a fuel in motor cars, motor cycles, scooters and other light vehicles. It is used as a solvent for dry cleaning clothes.

8. **Petroleum Gas:** It is obtained at the top of the fractionated column at a temperature below 40°C. Petroleum gas is a mixture of ethane, propane and butane. Its main constituent is butane which is burnt to give heat. It is easily liquified under pressure and is supplied

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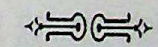
in cylinders as a cooking gas (liquid petroleum gas, LPG).

Except for asphalt, paraffin wax, lubricating oil, all other fractions readily burn producing heat and are used as fuels.

Many oil-wells produce natural gas (which mainly contains methane CH_4) as a by-product. However, there are some wells that produce only natural gas. Its great advantage is that it can be used directly for burning in homes and factories where it can be supplied through pipes as in Baroda (Gujrat).



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RADIO-ACTIVITY

Radioactivity was discovered by a French Physist, Henri Bacquerel, in 1896. He found that element uranium gives off some invisible rays which even pass through black paper and affect photographic film even in darkness. The elements like uranium, emit invisible rays which affect a photographic plate. These substances which emit such invisible radiations are called radio-active substances and the property of emitting invisible radiations is called radio-activity. Radioactivity occurs due to the instability of the nucleus of an atom which has too many neutrons in it. Such unstable nucleus tends to become stable by emitting alpha, beta and gamma radiations of three kinds as shown by the following experiment:-

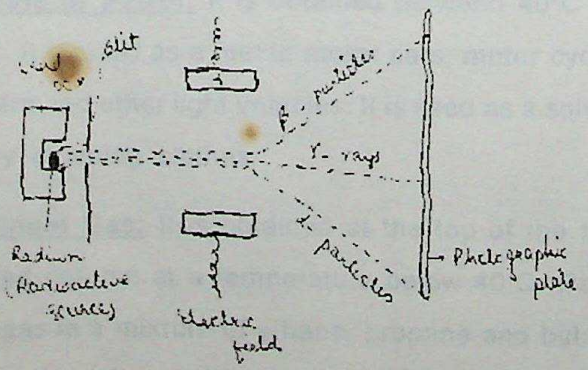

Fig. 4

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Experiment:- A small piece of radio-active element (say uranium or radium) is placed inside the cavity of a lead box and the invisible rays are passed through a slit in between the positive and negative plates of an electric field. The beam splits into three kinds of radiations:-

a) Alha (a) radiations deflect towards the negative plate of the electric field showing that these have positive charge. An alpha particle is actually a helium nucleus having a charge of +2 units and a mass of 4 units ($^{4}_{2}He$). Alpha particles have little penetrating power and cannot penetrate a sheet of paper. They have a speed of upto 10% of the speed of light.

b) Beta (b) radiations or particles deflect towards the positive plate of the electric field showing they are negatively charged. Beta particle has a charge of minus one (-1) and a mass of zero ($^{0}_{-1}e$) symbol). In radio-active atom, a neutron splits up to form a proton and emit an electron. b particles have a greater penetrating power than alpha particles and can pass through a sheet of paper but not through a sheet of aluminium. The speed of beta particles is greater than that of alpha particles, being upto 90% of the speed of light and can darken a photographic plate appreciably.

c) Gamma (g) rays have no charge and no mass ($^{0}_{0}g$ symbol). They are electro-magnetic waves like X-rays

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and are the most penetrating of the three radiations. They pass through a sheet of paper or aluminium but are stopped by thick sheets of lead. Gamma rays darken a photographic plate deeply. They travel the fastest with hte speed of light.

Thus the nucleus of radio-active elements disintegrates causing radio-activity.

Uncontrolled nuclear fission reaction of radio-activity of uranium 235 is used to produce atomic bomb. And conrolled nuclear fission reaction of radio-activity of uranium-235 is used in nuclear reactors to generate electricity.

A nuclear fusion reaction of radioactivity is used in making hydrogen bomb. Heavy hydrogen atoms are heated to an extremely high temperature fo fuse together to form heavier atoms of helium and release tremendous amount of energy in Hydrogen bomb. The sun also produces energy by radio-activity of nuclear fusion.

Radio-active isotopes are used in the treatment of cancer. Gamma radiations emitted by cobalt radio isotope are used to burn off cancerous cells (radio-therapy).

Radio-active isotopes are used to detect the presence of tumors and blood-clots in the human body.

Radioactivity is used in industry to detect the leakage

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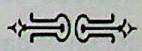
in underground gas-pipe lines, oil-pipe lines and even in water pipes.

The radiations from radio-active isotopes are being used for developing high-yielding, disease-resistant varieties of wheat, rice, jute, ground-nut etc., and also for disinfecting foodstuffs for long periods.

Carbon-dating, that is, the method of estimating the age of old carbon (wooden) objects like dead plants is done by measuring the levels of C-14 (Carbon-14) radio-activity in them. If an old wooden object has 50% as much carbon-14 radio-activity in it as a living sample of it, its age is 5800 years. If the old wooden object has 25% radio-activity its age will be 2x5800=11600 years. The method of estimating age of archaeological samples is known as radio-isotope dating.



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ATOM AND ATOM BOMB

An atom, the smallest particles of matter, is itself made up of three fundamental particles-electrons, protons and neutrons. All the atoms of an element contain the same number of electrons and protons but they may have different number of neutrons. For example, all the uranium atoms contain 92 protons, 92 electrons each, but all the uranium atoms do not contain the same number of neutrons. Some uranium atoms (U-235 ones) contain 143 neutrons and another uranium atoms (U-238 ones) contain 146 neutrons. So, uranium element is found in two forms-the isotopes U-238 and U-235. The rarer of these two isotopes U-235 has a very peculiar property. The nucleus of this variety is highly unstable. Even a slow stray neutron colliding with it can rupture the nucleus completely. The nucleus splits producing smaller nuclei of barium and krypton, three neutrons and a lot of energy. The nuclear fission of U-235 is explained diagramatically as follows:

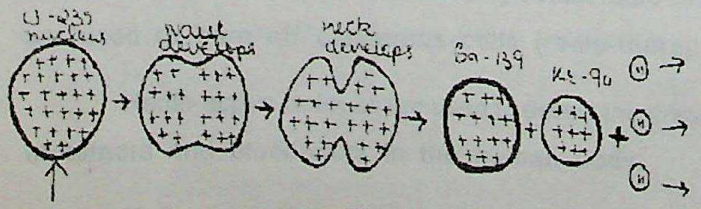

Fig-5

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A slow-moving neutron attacks U-235 nucleus and enters into it. The nucleus gets elongated and a waist develops in it. Due to the increased repulsion between the protons, a neck develops in the nucleus. The increased repulsion between protons ultimately leads to the breaking up of the U-235 nucleus to form two smaller nuclei of Ba-139, and Kr-94 alongwith the emission of three neutrons. A large amount of energy is also released in this fission process.

A single uranium atom undergoing fission can release 200 million times as much energy as that released by the combustion of a single molecule of natural gas.

$^{235}_{92}U + ^{1}_{0}n$ Fission $^{139}_{56}Ba + ^{94}_{36}Kr + 3^{1}_{0}n$ + tremendous energy

Another element Plutonium (Pu-239) also undergoes fission easily as its nucleus is delicately balanced. Plutonium is not found in naure but can artificially be made from U-238.

If there are a large number of U-235 atoms packed together, the three neutrons produced by the fission of first U-235 atom would cause the fission of three more uranium atoms producing 3x3=9 neutrons and a lot more energy. These 9 neutrons can cause the rupture of 9 more uranium atoms giving out 9x3=27 neutrons and yet more energy. Such a multiplying process is called chain - reaction.

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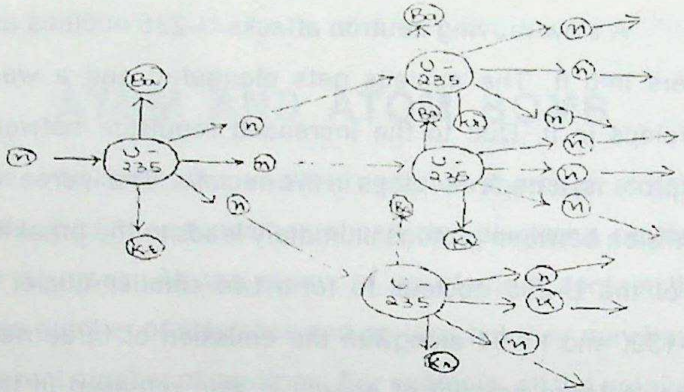

Fig-6

If this chain-reaction is allowed to go out of control, the result is nuclear explosion-the atom bomb. It has been calculated that in an uncontrolled fission reaction, about 10^{20} U-235 atoms undergo fission in just one minute producing an unmanageable amount of heat energy. The highly destructive atom bomb is based on the nuclear fission reaction of Uranium-235. Two atom bombs were dropped on the cities of Hiroshima and Nagasaki in Japan during the second world war causing enormous destruction of population and material.

However, atomic fission can now be used for peaceful purposes, for producing electric power in atomic reactors. Let us go back to the atomic fission reaction. If out of 3 neutrons produced by the fission of one uranium atom, 2 neutrons are quickly removed by absorbing them in cadmium or boron before they can cause any further fission, we will be left with only one neutron which can cause the

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fission of only one more uranium atom, and release manageable amount of energy. If we continue to remove 2 neutrons at each stage, then only one uranium atom will undergo fission at a time, and energy will be released in a controlled way at a steady rate. It would be easy to absorb such energy and convert it into electricity. When such a balance is reached, that is the number of uranium-235 atoms undergoing fission remains constant, we say that the reaction is critical or that we have reached criticality. The first person to have successfully carried out critical nuclear reaction was an Italian Scientlist, Enrico Fermi, in the United States on 2 December, 1942. Since then atomic energy has been used to produce electricity in nuclear power plants.

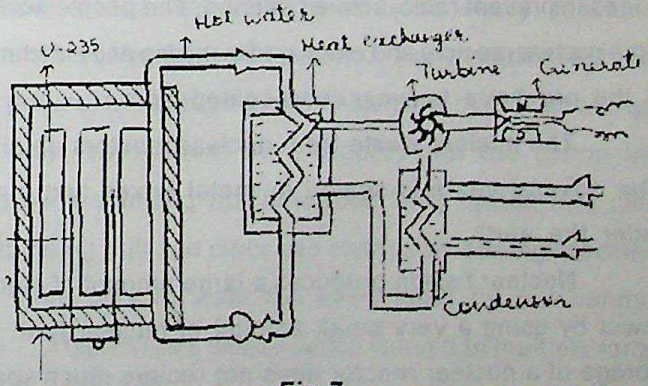

Fig-7

A systematic diagram of a nuclear power plant is shown. The controlled fission of enriched U-235 takes place in the reactor. As the slow-moving neutrons cause fission of U-235 atoms, cadmium or boron rods are inserted into the fuel and slowly withdrawn till they absorb the corect

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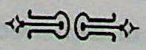
number of neutrons leaving behind just the right number to sustain the reaction and yield energy at the constant rate. The reactor is then said to have gone critical. Heat generated by the fission process is carried off by liquid sodium and is used to boil water to produce steam in the Heat Exchanger. The steam drives a turbine which is connected to a generator to produce electricity and is sent for transmission. The spent steam is condensed into water in a condenser which goes back into the heat exchanger. Graphite or Heavy water (D_2O) is used around Uranium to slow down the speed of neutrons.

The nuclear reactors are located outside the town population and the reactors are covered with thick coats of lead to prevent radio-active pollution. The people working in the nuclear reactors and employed in mining and enrichment of the ore have to wear lead-coated aprons.

The nuclear waste from nuclear reactors obtained after several years is sealed in metal boxes and buried under the earth.

Nuclear fission produces a large amount of electric power by using a very small amount of nuclear fuel. The storage of a nuclear reactor does not require much space.



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MACHINES

Most of the mechanical work that man has to perform is done with the help of what we call the "Mahines". Machines have made man's life increasingly pleasant and comfortable. If we visit a factory or walk down a street or drive through a country, we see machines at work, lifting heavy loads, pushing, pulling, cutting, digging and doing all sorts of other things that need to be done easily. Machines do much of the work of the world. For instance, they dig the ground to produce some cash crop by a tractor, reap the crop, say cotton, by a reaper, turn the cotton into yarn by a spinning machine, and then thread into cloth by spinning mill and cloth into clothes by sewing machine. We have only to wear the sewn cloth by our hands.

Machine is a device which is used to multiply force, increase speed or change the direction of force.

A screw Jack is a machine. It is used to lift a car higher in order to remove its wheel for mending its puncture. It would not be possible to lift the heavy car with our hands. The screw Jack multiplies force and it

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changes the direction of force. We apply force in the horizontal direction and the car gets lifted in the vertical direction.

Cycle is a machine. It increases speed and we reach destination sooner than by walking.

Similarly, a lawn-mower does work easily for us by multiplying force.

Man used a club, the first machine probably, as a weapon of defense against wild animals. Club (a rod or branch of a tree) is a machine as it permits a force to be applied with greater advantage. Then man learnt to make a spear and an axe by fastening a sharp edge to a club. These are also machines.

There are really six kinds of simple machines. Combination of two or more of these and modifications of some of them make all and every kind of intricate and complex machine.

1. Lever: We have seen a big rock or stone being moved from its place or lifted by using a long iron rod with a piece of stone as a support below. This strong rod is a lever. Levers are used in driving a nail into a board or trying to pull it out with a claw-hammer. The hammer used in this way is a lever.

The see-saw is a leverl. A small boy can lift a bigger one, by increasing the power arm or shifting the fulcrum. Levers have three elements-force, resistance and

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fulcrum. The pull or push that is applied at a place is called force and the weight that is lifted is called the resistance and the pivoting point is called the fulcrm. These elements are not always arranged in the same sequence. Can-openers, hand-pumps, scissors, wheel-barrows, supericutters, fire-tongs, showels are all levers. The fundamental purpose of the lever is to translate a small force in to a large one. This is done by placing the fulcrum as close to the weight and thus as far from the force applied as is practical. In a see-saw one child can lift a number of children if the fulcrum is placed as close as possible to the larger number of children.

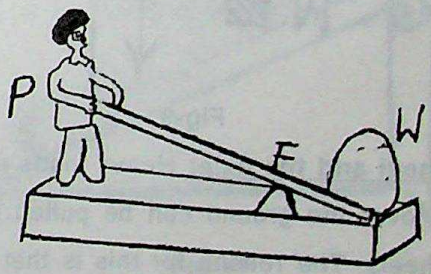

Fig-8

2.**Pulley:** It is a grooved disc which revolves round its axis and has a rope running over its rim. We see a flag raised to the top of a flagpole by the use of a pulley. The pulley makes it possible to raise a flag without climbing the pole. The pulley was used in ancient Egypt in the building of great pyramids. Usually a combination of several pulleys actually magnifies force. Using a compund pulley

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a man does not have to pull so hard as in a single fixed pulley. Several pulleys with ropes together are used in raising or lowering life-boats from ships. Pulleys are used in cranes to lift loads and in curtains to move them conveniently.

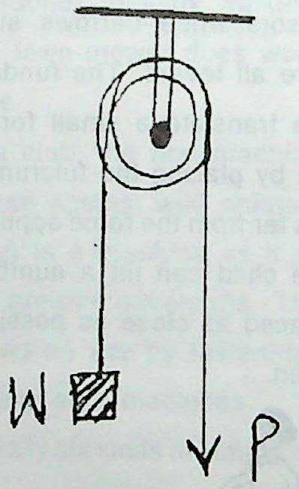

Fig-9

3. **The wheel and the axle:** Heavy loads that could not be pulled over the ground can be pulled easily if they are on wheels. The reason for this is that only a small part of the wheel rests on the ground at one time. This reduces the friction of two surfaces. The less the friction there is, the easier it is to slide along the road. The invention of wheel has revolutionised transportation, and modern machinery would not be possible without it. We apply a small force at the steering wheel to turn the big bus on wheels. Wheels and axles can be used to transmit power

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when they are connected by belt.

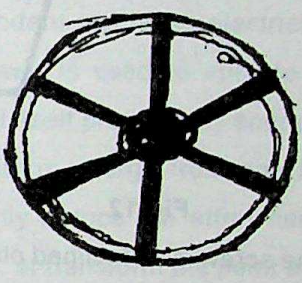

Fig-10

4. **The inclined plane:** If we want to raise a heavy barrel into a truck, we use a heavy board (the inclined plane) to roll the barrel up. Stair-ways are also inclined planes.

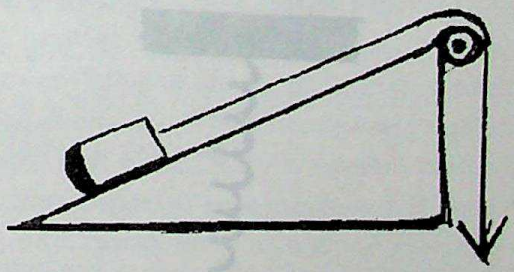

Fig-11

The Wedge: It is a double inclined plane which moves into the resistance. We have seen a wood-cutter splitting logs by driving an iron-wedge into the wood by blows of a heavy hammer. Axe is a wedge too. We can exert a greater force with wedges than we can without them. Many of the common tools, the knife, the razor and the nail are wedges.

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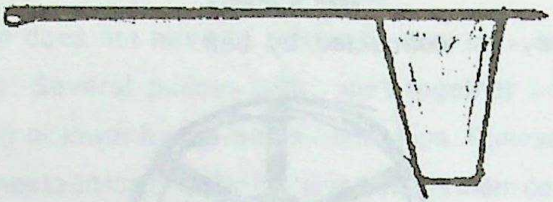

Fig-12

6. **The Screw:** The screw is an inclined plane which moves round and round as it moves forwards, upwards or downwards. In this case also we have to use a small force to overcome a greater resistance. It would be impossible to lift an automobile to change its tyre without a screw-Jack as machine.

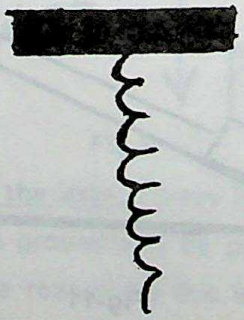

Fig-13

Complex machines are made up entirely of simple machines. A watch, an automobile and the elaborate machinery that we see in factories are examples of compound machines, but they are all made up of more than one simple machines that work together. But a machine uses force to make

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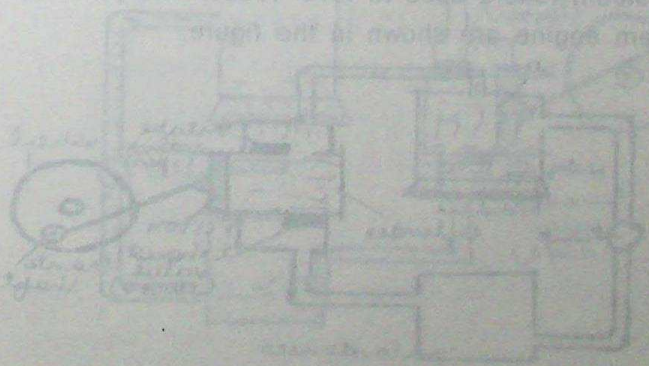
it operate whether muscular force of humans or animals like horse. In modern machines electricity, steam, wind, petrol, diesel power is used to operate them. A simple machine does not itself provide any energy for doing work, nor does it transform energy from one form to another. The machines only reduce the effort needed to perform mechanical tasks, or transform the point at which the effort is needed to a more convenient point.



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ENGINES

A device by means of which heat energy is converted into work (mechanical energy) is known as the Heat Engine.

Different kinds of heat engines are:

a) Steam enginer b) Petrol engine

c) Diesel engine d) Jet and rocket engines

An engine whose energy comes from electricity is called a motor.

a) In a steam sngine, steam under high pressure enters the cylinder, makes a piston move which moves a rod, and the rod turns a wheel. It was James Watt in 1768 who produced a successful steam engine. His work was used by George Stephenson (1817) who made an engine for a locomotive (railway engine). Since that time steam has been used to run engines for factories, ships, trains and in steam rollers used to level roads. The parts of the steam engine are shown in the figure.

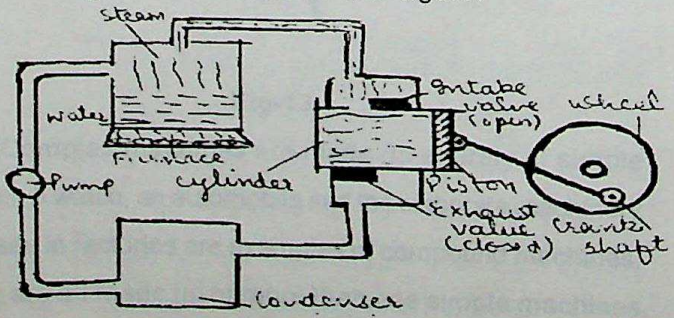

Fig-14 (i)

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Since steam is produced outside the cylinder, the steam-engine is also called an external combustion engine. The steam engine works in two strokes:

i) **Expansion stroke or Power stroke:** Coal is burnt to produce heat which boils the water in a boiler to produce steam. The hot and compressed steam in introduced into a metal cylinder fitted with a moveable piston. The steam exerts a large force on the piston and pushes it outwards. The piston rod attached to the piston pushes the crank-shaft which rotates the wheel.

ii) **Exhaust stroke :** The spent steam is taken out from the cylinder automatically as the two valves open and close one after another. The spent steam goes into the cylinder where it is cooled to form water. This water is sent back to the boiler by the pump.

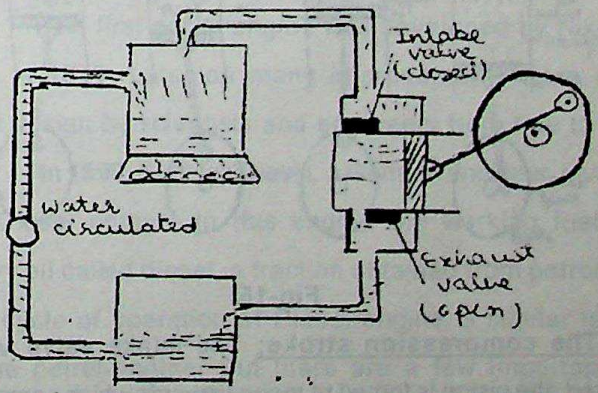

Fig-14 (ii)

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The pushes of the piston to the crank-shaft keeps the wheel turning continuously. The back and forth movement of the piston is translated into rotary motion by the crank-shaft arrangement.

b) **Petrol Engine:** Petrol engine and the Diesel engine use petrol and diesel oil respectively and not coal as a fuel. The fuel here burns inside the cylinder so these engines are called internal combustion engines.

The petrol engine works in four strokes.

(i) **The intake stroke**: As the engine starts, the piston moves downwards in the cylinder, the intake value V_1 opens and petrol vapqur and air mixture is sucked from the carburettor into the cylinder.

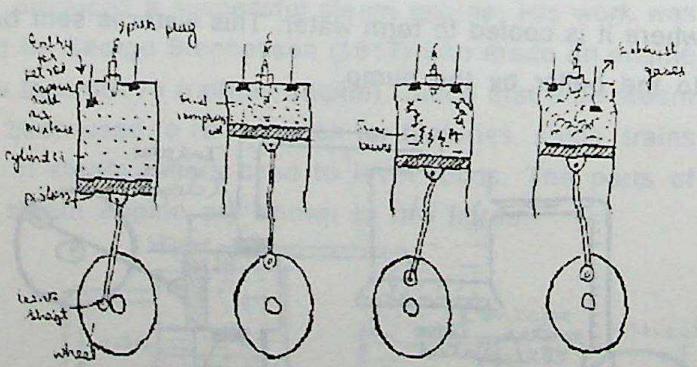

Fig-15

(ii) **The compression stroke:** The intake valve V_1 gets closed, the piston is forced to move upwards which compresses the fuel mixture to about $1/8^{th}$ of its original volume.

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(iii) **The Power stroke:** This is the only stroke of the engine which provides power or energy. The spark plug here produces a little electic spark inside the cylinder. This sets fire to the petrol-air mixture with a little explosion producing a large volume of gases and enormous amount of heat. The pressure of expanding hot gases pushes the piston downwards with a great force. The piston rod pushes the crank-shaft which turns and rotates the rear wheels of the car and move it forward. The power stroke is also known as the expansion stroke.

(iv) **The exhaust stroke:** The exhaust valve V_2 opens as the piston is pushed upwards the spent gases are expelled through the exhaust valve into the atmosphere. The above four strokes of the engine are repeated again and again and the wheels keep rotating.

The first petrol engine was developed by Nikolaus Otto in 1876. Later on many improvements were made in its design by scientists and engineers from tme to time.

In 1890, Rudolph Diesel, a German engineer, invented the Diesel engine. In this engine the working fuel is a heavy oil called diesel, a fraction obtained from petroleum. The cycle of operation of Diesel engine is similar to that of the petrol-engine. But there are a few important differences between the two. In a diesel-engine no spark plug is used. In the intake-stroke only air is admitted into

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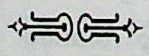
the cylinder and the compression stroke, compresses air to about 1/16th of the original volume which raises the temperature to about 1000°C of the air. At this stage diesel oil is sprayed into the cylinder which burns automatically at this high temperature (no sparking plug is used).

The diesel engine requires the use of strong and stout cylinder which can withstand high pressure. The diesel-engine is, therefore, heavy and is used in heavy vehicles like trucks, buses, trains and ships.

The engines fitted in motor-cycles, scooters and other two-wheelers are internal combustion engines. These are usually two-stroke engines. In these engines, the whole cycle is completed in just two strokes.



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ELECTRICITY AND ELECTRIC MOTOR

A rubber comb may become charged with electricity when it is passed through hair, even sparks may be produced. We also observe lightning flashes during a thunderstorm. These are examples of static electricity. The atoms of all matter consist of nuclei which are positively charged, surrounded by electrons which are negatively charged. When there are just enough electrons to balance the positive charges in the nucleus, the body is electrically neutral. If some of the electrons are removed from an object (as by rubbing a glass rod by a piece of silk,) there will be more protons than electrons left and therefore the glass rod will be positively charged. As against this when a comb is rubbed on hair, it picks up electrons from the hair and because of excess of electrons becomes negatively charged. Lightning is a form of static electricity. In this case, so much electricity accumulates that it is able to jump from one cloud to another or from a cloud to the ground. Static electricity is ordinarily motionless. It does, however, jump great distances between clouds or

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between a cloud and the earth only when large charges accumulate. Most of the time it remains stationary until it is neutralized by the moisture in air.

Current electricity, on the other hand, can be run along wires, can be stopped, turned on again and made to do useful work for us. Current electricity is a stream of electrons flowing through a conductor. It was not until the beginning of 1800 A.D. that any one could discover a way of making an electric current. At that time an Italian Scientist, names Alessandro Volta, made the first electric cell which gave a continuous current through a wire. He used two metals-copper and zinc in an acid and produced a current of electricity. Its modification called the dry cell is in vogue in torches, portable radios, transistors to supply electricity.

Storage battery is an improvement on the wet or dry cell. It has lead plates and sulphuric acid. It gives stronger current and is used in automobiles to furnish energy to turn the starter, operate the lights and horn and ignite the petrol-air mixture by means of the spark plug. Cells and storage batteries convert chemical energy into electrical energy.

Actual revolution in generating electric current was brought about by Michael Faraday. When an electric conductor (Copper wire) is passed through magnetic lines of force of a magnet, an electric voltage is induced in the conductor.

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Such dynamos or generators supply electricity to industry and our homes.

AN .A.C. GENERATOR;

A simple A.C. (alternating current) generator consists of a coil made of a large number of turns of insulated copper which is rotated rapidly between the poles of a strong horse-shoe magnet. The generator-coil is fixed on a common shaft with a turbine which is rotated by the pressure of water or steam. The free ends of the coil are connected to two circular pieces of copper metal called slip-rings.

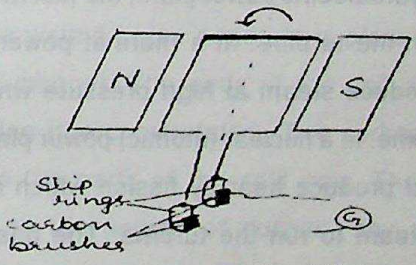

Fig:16

As the coil rotates, it cuts the invisible magnetic lines of force of the magnet producing an effective induced electricity. The slip rings are attached to carbon brushes which carry current away for use in homes and in industry. Due to the change in the direction of motion of the two sides of the coil in the magnetic field after every half revolution, the direction of current produced also changes after every

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half revolution. The current obtained is alternating current. All the major power plants produce alternating current (A.C) at a voltage of about 22000 volts. Alternating current can be stepped up to a very high voltage by using transformers and hence it can be transmitted over long distances without much loss of power.

In a D.C. (Direct current) generator, the two free ends of the coil are connected to a commutator consisting of two half rings of copper producing current always in the same direction. The stepping up of voltage is not possible with direct current (D.C).

In a hydroelectric power plant, the fast moving water is used to run the turbine. In a thermal power plant coal is used to produce steam at high pressure which is used to run the turbine. In a nuclear (atomic) power plant uranium-235 is split to produce heat by fission which heats water to produce steam to run the turbine. The basic principle in any generator is that of Michael Faraday that induced electric current is produced by a coil rotating rapidly within a magnetic field.

Electricity to-day is the best servant of man. We have to push a button or throw a switch and electricity brings us light, heat and entertainment into our homes. Thousands of machines in factories and at other places work by electricity.

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ELECTRIC MOTOR: Electric motor is opposite to that of an electric generator. Magnetism produces motion in a conductor carrying current.

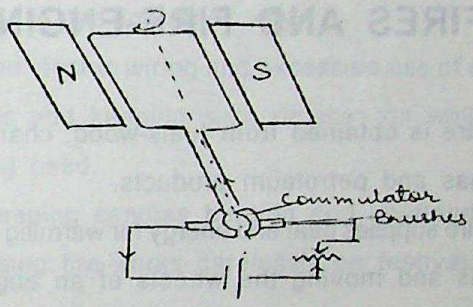

Fig: 17

In the modern design, rectangular loop of insulated copper wire wound on an armature is placed between the poles of a magnet. The ends of the coil are connected to a split ring (the commutator). Two carbon brushes are attached to the parts of the split ring. The brushes are connected to the source of current, say a battery. As the current is passed through the carbon brushes, and commutator to the conductor wound on the armature, the coil moves down and then up as the commutator reverses the current. So a continuous rotatory motion is produced and an electric motor is obtained. In this way the electrical energy supplied to the motor is converted into the mechanical energy of rotation.

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FIRES AND FIRE-ENGINE

Fire is obtained from fuels-wood, charcoal, coal, natural gas and petroleum products.

Fire supplies heat and energy for warming us, cooking our meals and moving the wheels of an engine.

Besides, electricity also gives us heat in heaters, electric cookers, toasters and electric irons.

So, heat from fires and electricity has great usefulness,, but, like so many other valuable things, heat from fires and electricity has certain drawbacks. When out of control, it is terrifying and can destroy property, life and forests.

Fires are almost always the result of carelessness on the part of someone. Fire can be caused:

a) By careless smokers or campers- throwing away bits of glowing cigarette bits on any combustible material, oils, dry grass or bedding.

b) By children playing with match boxes and match-sticks.

c) By leaks in paraffin stoves or excessive pumping or adding oil while the stove is on.

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d) By forget fullness about turning off gas in the kitchen and the naked flame burning it.

e) By storing fuels like charcoal, cowdung, wood shavings, saw-dust etc. in the improper way

f) By bad electric wiring and excessive use of electric heaters, irons and keeping such devices on while they are not being used.

g) By keeping candles burning and unattended.

h) By using fire-works carelessly on festivals or in marriages.

If fire is small, we should try to extinguish it, if it is possible to do so without danger to ourselves or to others. It is said that about one-third of the fires can be easily put out with pails of water, sand or hand fire-extinguishers.

To put out a fire, we have to keep oxygen or air away from it and also lower the temperature of the fuel below its ignition- temperature.

To exclude air or oxygen, the small fire should be readily covered with clay, sand, asbestos or throwing a heavy blanket or coat over the small fire. If a blanket or coat is not available, the flames on the person's clothing can sometimes be smothered by rolling the person on the ground.

A simple soda-acid type fire extinguisher can also be used. It contains two containers which contain sulphuric

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acid and baking soda respectively. As the two get mixed by pressing the knob, carbon dioxide gas is evolved which settles over the fire and extinguishes it

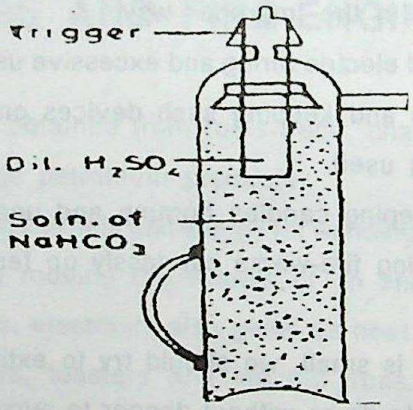

Fig: 18

For oil and electrical fires, fire-extinguisher containing a chemical called carbon tetrachloride is used. But certainly it is better to call the fire department if there is the slightest doubt about the extent of fire. If fire is noticed in a room, the doors of the room should be closed to confine the fire to the room and prevent fresh air from entering the room which can aggravate the situation and the alarm should be raised and the fire-engine called through a telephone in your home or through public call telephone-by dialing 101. Fire-station is prompt in sending the fire-engine vehicel with a team of firemen without loss of time. The vehical also carries a ladder for rescuing people or

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making entry into the burning building.

Usually, a fire-engine carrying water with it is known as water-tender. Water tender usually carries water from 400 gallons to 600 gallons. This water is used to fight the fire as soon as the fire-engine arrives at the scene of fire. Meanwhile, water is tapped from the nearest source of water supply, that is, either hydrant, or river, canal, pond or spring.

Hydrant is essentially located on water-mains from which domestic supplies are obtained and is under the ground covered with an iron-box.

Engine fitted in front of the vehicle gives power to lift water from depth by suction. With suction inlet a hose is connected to draw water in the pump and the hose is further connected with delivery outlet which is a metallic branch pipe with small bore which converts the water pressure into a jet. Water dropped on the fire excludes oxygen (air) from the fire and makes the combustible matter wet thus cooling it below the ignition temperature and the fire gets extinguished.

A fire-engine carrying chemical foam compound is known as foam-tender and this appliance is used for fighting oil fires, rubber fires and fires caused by electrical short-circuiting.

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FLIGHT AND AEROPLANE

Man has been travelling long distances by air in a short time. It is a matter of hours to travel to London from where you are sitting. It is possible to travel faster than sound in a jet plane. This has made us all live closer together.

For centuries man dreamed of flying. As he saw birds flying through the air, he wished to imitate them. Some attached wings to themselves and flapped them to get off the ground and fly. But these attempts proved unsuccessful.

The next development in air-flight was the balloon. Some one discovered that paper bags filled with hot air would rise in air. Two French men, by the name of Montgolfier built a bag of paper lined with linen which in 1783 carried two men over Paris. Burning wood heated the air for the balloon. The balloonist would detach down by a parachute and the balloon was later filled with hydrogen and then helium, but never efficient for practical purposes. Even now we use balloons on festivals and in country fairs.

With the addition, of a steering mechanism to control

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the direction of flight and a petrol engine and a propeller, the air-ship was developed. It still used hydrogen and helium to lift it up in air. This type reached its greatest development with the huge air-strips developed by Count Ferdinand Von Zepplin. These ships carried heavy loads of both frieght and passengers. But being unsafe in rough weather and with many serious disasters in 1920-1930, these were abandoned entirely.

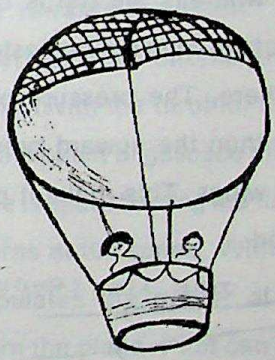

Fig: 19

The first air plane-heavier than air machine, carrying man was made on December 17, 1903 by Orville Wright and his brother Wilbur Wright (wright brothers) driven by its own power. The flight lasted for only 12 seconds and 30 meters were covered, and on the same day a second flight of 260 meters were covered in 69 seconds.

HOW CAN AN AEROPLANE FLY?

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Moving objects can stay in the air for as long a time as they can keep moving rapidly. Air has weight and exerts pressure which is used to lift the plane off the ground. The force of air acts against the force of gravity in order to lift the plane and then it is kept moving and its movements are controlled.

The wings of an aeroplane are so shaped that air flowing over them produces low pressure. The bottom of the wing is straight, whereas the top is curved. The air moving over the top of the wing moves faster, thus making the pressure less there. The pressure of the air down on the wings is less than the upward pressure of air on the underside of the wings. This make it possible for the aeroplane to be lifted.

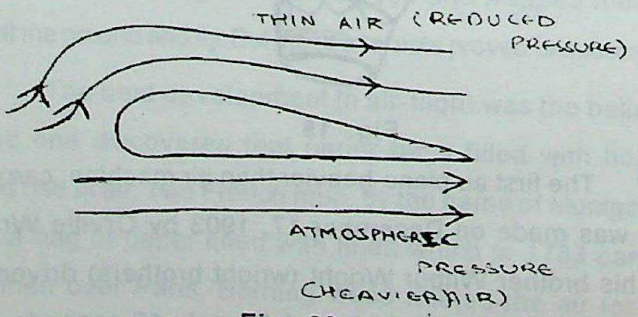

Fig: 20

In order to fly an aeroplane, the petrol engine is first started and propellors (or blades) are made to revolve rapidly. Because of the shape of propellor blades, the pressure is lower in front of the propellor than behind so that the

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plane is pushed ahead faster and faster along the ground until the excess of pressure beneath the wing is sufficient to lift the aeroplane into the air. The pilot changes the angle of the wings so that the air pressure will be still less on the top of the wings than it is on the bottom and the plane takes off. Every plane has a flying speed at which the lift is sufficient to maintain the plane in the air. If the plane slows down below the flying speed, it begins to drop towards the earth.

The pilot uses the throttle and steering wheel to control the plane. With the throttle, he controls the speed by governing the amount of gasoline that goes to the engine. When the throttle is open, feeding the full amount of gasoline, the propellor turns at full speed. With the steering wheel, the pilot manipulates the rudder at the back. He uses the rudder to turn the plane. Pilot can control the elevators which can make the plane nose up or down. The plane begins to climb as the elevators go up forcing the tail down and vice versa. The aeroplane engine is like a car-engine which operates through combustion of gasoline mixed with air.

The first man to fly an aeroplane from NewYork to Paris across the Atlantic ocean was Lindberg on May 20, 1927. The first woman was Amlia Earhart on June 17, 1828 from New foundland to Wales.

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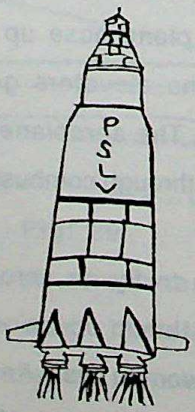
There are several types of aeroplanes each designed for specific purpose. There are sea-planes which can land on water. The landing gear consists of light floats called pontoons. Amphibian planes are equipped to land on or take off from either land or water. They have both pontoons and wheels.

Helicopter has propellor called a rotor on top. It can go forward or backward and can descend vertically. It does not need a runway. It lacks speed and is of small size. It is used for rescue work.

The present trend is towards jet planes and rockets which have no propellors. They travel faster than sound, more than 800 kms/hour.

The principle involved is that when gases are expelled at the rear, there is counter driving force forward. There is reaction forward to the expelled action of gases.



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AIR POLLUTION

The contamination of air in cities, with dust, smoke, harmful gases like carbon monoxide, excess carbon dioxide, sulphur dioxide, nitrogen oxides, fly ash and fumes is called air-pollution. These undesirable substances are added by burning of fossil fuels like coal, natural gas and petroleum into the atmosphere. Factories release harmful gases like nitrous oxide, carbon monoxide, sulphur dioxide while petrols chemical plants release hydro-carbons which pollute the air. Excessive use of scooters, three-wheelers, cars, matadors, buses, trucks and trains has increased the proportion of harmful substances in the air.

Heaps of garbage and open drains give harmful gases to air. Cigarette smoking releases carbon monoxide and nicotine which pollute our surrounding air. Leak of radio-active radiations from atomic power plants if present near cities prove quite harmful to the atmosphere. De-forestation has added fuel to the fire. Cutting of trees has reduced photosynthesis, thus excess carbon dioxide from breathing of animals, burning of fuels and decomposition

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of animal and vegetable garbage remains in the air.

The polluted air is very harmful to the people living in cities. It causes bronchitis, irritation of nose, eyes and throat, influenza, asthma, pneumonia and heart problems. The deficiency of oxygen in blood may cause headache, dizziness, cardiac and pulmonary changes and even death.

Carbon monoxide poisoning from gas stoves, charcoal stoves and coal heating devices in closed rooms are reported every year and the poisoning causes death as even a very small amount of carbon monoxide in blood affects the oxygen carrying capacity of haemoglobin in blood.

Sometimes natural release of harmful gases along with lava from volcanic eruption, the dust raised from strong winds and storm, and also forest fires and fog add to the pollution of atmosphere. The smog besides causing various health problems reduces visibility, thereby affecting air traffic and movement of vehicles

In order to minimize air-pollution, the following methods should be adopted

1. Trees should be planted on road sides and round homes so that excess carbon dioxide is taken by the green leaves for making food in the plants.
2. Parks should be provided in cities and these serve as lungs for the population.
3. All roads should be tarred and the sides of the

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roads should be turfed to prevent dust going into the air by strong winds or storm.

4. Industries should be located outside the cities.

5. Old and used up vehicles which eject smoke and hydrocarbons must be discarded

6. Fossil fuels should be replaced by electrical energy and solar energy. Electric trains should replace steam-engine and diesel locomotives. Solar cookers, solar heaters, and lamps using solar cells should be used more and more.

7. Cigarette smoking should be banned in public places and buses.

8. There should be proper disposal of refuse and garbage. Septic tanks should be provided in every home for refuse disposal. Open drains should be covered. Garbage should be taken to fields to change it into manure, Use of polythene bags should be banned.

9. Use of loud-speakers, amplifiers, noise-producing vehicles should be restricted to prevent noise-pollution which otherwise cause headache, blood pressure and other emotional disturbances.

Modern household gadgets like coolers, mixers, fans, grinders, washing machines should be lubricated from time to time

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ORIGIN OF MAN

Science believes that all plants and animals in the world have developed in a natural way from earlier forms that were simpler. And the life originated in sea-water. The early atmosphere of earth had elements like carbon, hydrogen, nitrogen and oxygen. During lightning and thunder these elements formed hydrocarbons, simple sugars and simple proteins. These complex organic compounds were washed away by rain into the oceans.

In the oceans these complex organic molecules were converted into first living organisms called blue-green algae. This happened about 3.7 billion years ago, as the oldest rocks found in Greenland have about the same age. These blue-greens algae could trap sunlight and could carry out the process of photosynthesis and release oxygen to the atmosphere. This primitive form of life i.e., the primitive unicellular organisams like blue-green algae gave rise to a wider variety of multicellular plants and animals over a very long period of time. From about this time 2 billion years ago, oxygen evolved through photo-synthesis began

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to replace carbon dioxide as the second most abundant constituent of the atmosphere. The generation of organisms that were evolved not only had a greater tolerance for oxygen but were able to use it to drive life processes much more efficiently than their predecessors. According to Darwin, the evolution took place through the slow act of natural selection. The kinds of individual species, which were in accordance with the condition of life, survived, whereas others became extinct. Darwin explained this phenomenon under two headings- "Natural Selection" and "Survival of the Fittest". The rise of oxygen level in the atmosphere accelerated the evolutionary chain in two ways. First, it provided opportunities to the new and more advanced forms of life to evolve more efficient metabolic processes. Second, some of the oxygen was converted into ozone to form a protective layer that would screen the deadly ultraviolet radiations emitted by the sun. In a more friendly atmosphere life could raise its head above the sea water and come ashore to evolve into evermore sophisticated form. The reduction of carbon dioxide in the atmosphere in turn reduced the Greenhouse effect and the atmosphere reached a new equilibrium which was more comfortable to life. Around 600 million years ago (0.6 billion years) our atmosphere had reached the comfortable state for life as we know to-day.

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The story of life on earth over the last 600 million years is one of the tremendous explosion of life forms with man at the apex of the evolutionary tree. The continuous transformation gave rise to newer organisms like fish, frogs, monkeys, chimpanzee and ultimately the caveman through organic evolution.

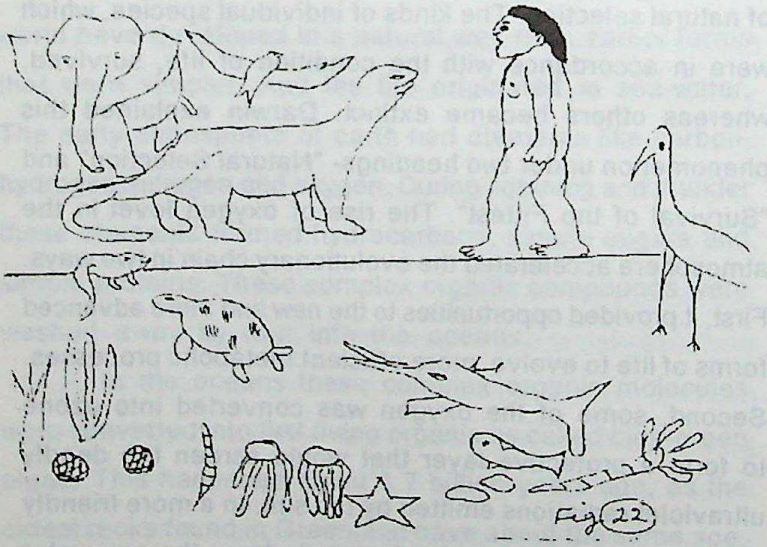

Fig: 22

It is now known that all the inner planets of the sun's family namely, Mercury, Venus, Earth and Mars are made up of the same elements. But the Earth is the only planet among them where life could evolve and exist. The three major factors that:

a) The earth is just the right distance from the sun (the earth is neither too hot nor too cold).

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b) the earth has just the right mass to make sure that there is an ocean of water on it to support life.

c) the earth has just the right gravitational field helping the earth to hold on to its atmosphere, helped the earth to lead the biological revolution.

In trying to prove that evolution did take place, Scientists depend on three chief "signs".

1) One of these is the study of fossil remains of animal and plants of past ages. Life has progressed from one form to another.

Fossil remains of primitive men have been found that are as old as one million years. Fossil remains of crab like animals have been found that go back to a time five hundred million years ago. These fossils show that fish developed in oceans before amphibians, amphibians before reptiles, reptiles before birds, and so on.

2) Another "Sign" of evolution comes from the study of embryology, the growth of a new living thing from an egg. There is a time when embryo is like a fish, later it is like an amphibian, then it passes through the reptile stage and finally develops into a living bird form (just as the chick develops from the hen's egg). The unborn young of all animals go through the same kind of process, repeating their history of development.

3. The third "Sign" is the structure of the bodies of

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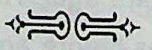
living animals.

The human body contains the same elements and salts as are found in sea-water. The bone and muscle structure in paddles of a turtle, the wings of a bird, the flippers of a whale, the front legs of a horse, and the arms of a man are similar. The relics handed down from man's earlier ancestors are "Signs" that led to the theory of evolution.

Some people feel that the theory of evolution goes against what is written in religious books like the Bible. But recently the great Pope John Paul 11 of Rome has agreed that the evolution of man can have taken place according to the will of God.



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HUMAN BODY AND THE BRAIN

Human body can be compared to an engine. Both need fuel (food) to be able to work. Both need oxygen for combustion and both give out waste-products. However, Human body can direct, control itself whereas an engine needs a driver to control it. There are various organs inside and outside the human body. The sense organs- eyes, ears, nose tongue and skin bring in sensations of sight, hearing, smell, taste and touch respectively. However, the organs inside the body are working continuously and keep the body alive and energetic. Inside the chest cavity are heart and lungs. Heart pumps blood to all parts of the body and the lungs purify blood by breathing in oxygen and breathing out carbon di-oxide. Inside the abdomen are stomach, intestines, liver, pancreas, spleen, kidneys and some ducless glands. Stomach and intestines digest food which gets absorbed into the blood through capillaries. Liver stores food (glucose) as glycogen which is given to the body when needed. Pancreas secretes pancreatic juice which helps in digesting food. It also produces insulin

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which regulates the absorption of sugar by tissues of the body. Spleen is the birth place of white cells of the blood and the kidneys excrete the waste material-urine from the body. Skin also excretes waste-material, that is sweat from the body through countless pores on it. And the king of all these organs is the Brain situated inside the head the bony cranium. It is the main organ of nervous system and is connected down to the spinal cord within the vertebral column. The brain is made up of soft nervous tissue consisting of neurons/nerve fibres and is connected to all parts of the body through nerves. It receives and sends messages to all organs through sensory and motor nerves respectively. It gets and carries messages in less time than it takes to bat an eye-lash. It contols all other organs of the body through nerves. It gives man knowledge of himself and the world in which he lives.

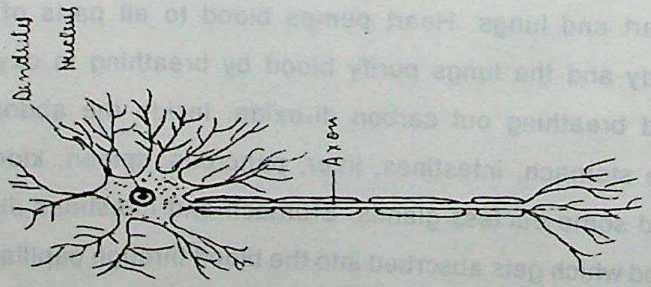

Fig: 23

Nearly all animals have some kind of brain. Apes have like us. Man's brain puts him above all other animals.

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Human brain is larger, heavier and has more dips and folds. Brain enables him to think, to learn and to make decisons. Man has flown in air, climbed mountains, gone to moon and under the sea, has invented so many things due to this Brain. In short, it makes him the master of the earth and of all animals.

Brain is shaped somewhat like cauliflower with ripples called convolutions. It has the following parts:

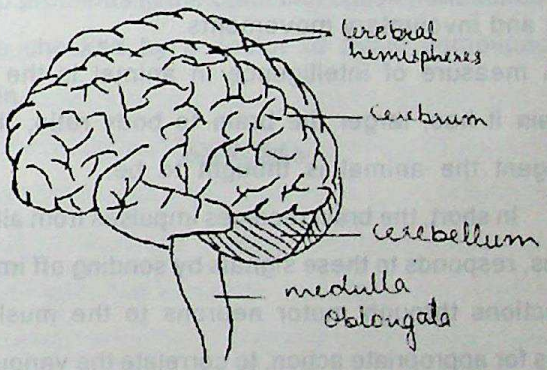

Fig:24

a) Cerebrum- the largest part and has two hemispheres. It is responsible for thinking, understanding, memory, will power, sensations and emotions of the body. It is the most important part of the brain. Its left side controls the right side of the body and the right side controls the left. If left side of cerebrum is injured, the right side of the body gets paralysed. The inability to move the side of the body

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may be temporary or permanent depending upon the seriousness of the injury.

b) Cerebellum- the lesser brain, at the bottom and back of the head controls muscles of the body in walking, running, jumping and other movements, and maintains the balance of the body.

c) Medulla Oblongata above the neck- control internal organs. Any injury to it causes death at once. It control the heart-beat, blood vessels, breathing and most of the reflex and involuntary movements.

A measure of intelligence in animal is the amount of brain it has, larger the brain to body ratio, the more intelligent the animal is thought to be.

In short, the brain receives impulses from all sensory organs, responds to these signals by sending off immediate instructions through motor neurons to the muslces and glands for appropriate action, to correlate the various stimuli from different sense organs and coordinate the bodily activities, to store information in itself as knowledge and modify behaviour according to past experience thus making the brain the organ of thought and intelligence.

The hair, the bones of cranium, the three membranes - the Durameter, Arachnoid and the Piamater including the fluids around the brain protect it and prevent it from being thrown against the bones of skull. Many

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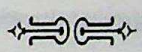
blood vessels supply oxygen to the brain to keep its many activities going. If oxygen stops coming for ten minutes or even less, death results. The brain is to be protected from any kind of injury. While driving a scooter, helmet must be used.

Proper exercise in fresh air, rest and sleep, a balanced diet, avoiding tension and blood pressure keep the health of you body including the brain. The strain in the muscles of the neck, face, scalp, in the blood vessels of the head area and problems in the brain can cause headaches which must be checked by a doctor to avoid complicacies in the brain.



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FRUITS

The Botanist uses the term fruit in a different sense from that of the housewife or green grocer.

To a Botanist the strawberry is not a true fruit but a collection of fruits whereas the tomato and the peapod with its peas are true fruits.

The fruit is the complete structure formed by the ovary and neighbouring parts of the flower after fertilization has taken place, and it contains the seeds which develop from the ovules after fertilization. The fruits of flowering plants take on many shapes and sizes and may be formed from one carpel or from many. Each fruit may contain one or a number of seeds.

It is convenient to divide simple fruits into two groups according to their condition when ripe

1) Dry fruits and

2) Succulent or fleshy fruits.

In dry fruits, the fruit wall is hard and dry. Nuts-hazel., sweet chestnut are dry fruits. Walnut is also called a dry fruit. Its fruit wall (Epicarp) swells and the mesocarp

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or middle region is thick and hard and what we eat in it is the inner endocarp which is edible. In the almond we don't eat the epicarp (green and velvety), nor the tough mesocarp or stony shell but we eat only it dry seed.

In fleshy fruits, the fruit wall is pulpy or fleshy. The seeds which are usually hard are embedded in the pulp. Example of fleshy fruits are grapes, orange, lemon, banana, pomegranate, cucumber, plum, cherry, peach, apricot, coconut, apple, pear and quince.

In pomegranate what we eat is the outer coats of the seeds. The succulent fruit, apple-pear and quince are formed not from the ovary but from the greatly swollen stem or receptacle. The carpels themselves become tough and form the core which contains the small brown pips or seeds.

Pine-apple is an interesting fruit. It is a swollen stem where the fleshy axis and the flowers have all fused together. In this seeds are rarely formed. At the top of the stem is a tuft of green foliage leaves.

Fruits, vegetables and grains should be our main foods according to latest research. Fruits are essential for the health of the body. They contain vitamins and mineral salts. If our body has to grow and function properly, vitamins of fruits must be taken. Lemon and other juicy fruits contain vitamin C which prevents the disease scurvy. The disease

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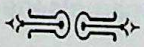
was common in the navy because of lack of fresh vegetables on long voyages. Lemon is now a regular part of the sailor's diet.

Tomato which is an example of fleshy fruit (though it is called a vegetable) contains vitamin A essential for good eye-sight and growth of the body.

Vitamin E, plenty in nuts and fruits, helps in free circulation of blood.

Mineral salts present in fruits make our teeth and bones strong and make our blood.

Fruits keep our digestion normal and prevent constipation and are good for brain-cells.



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SAFETY AND FIRST AID

The subject is very important for teachers especially in the elementary school where children have to be much looked after. General safety rules for children should be observed in the school.

1. Children should know how to empty out the school very quickly but methodically. This drill must be given every year in the beginning of the term and then repeated at least once a month. For this a sort of alarm bell is to be used.

2. Buckets of sand or fire-extinguishers must be placed in class rooms, especially in the laboratories where there is the danger of fire. If a boy's clothing accidently catch fire in a laboratory, use a blanket to wrap him or roll him on the floor.

3. If the school is situated on the roadside, the children should be helped to cross the road together in lines by halting the traffic carefully as the school closes for the day.

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4. On excursions the roll of children, should be taken before and after the event. On mountains, parties of at least three together should go about climbing. On long treks, rain coats and nailed shoes or boots should be used by children and at least one torch should be there with each party.

5. Play ground should be well kept and gim-shoes should be worn while playing the games.

6. No corporal punishment should be given to children, instead the children can be detained to do some unpleasant job for any offence or for not doing home task, at the end of the school.

7. Children should be corrected to keep proper posture while sitting, standing or walking and not stoop over the work.

Elementary first-aid should be provided in the school or at home if children happen to get hurt or wounded while playing. A first-aid box containing some antiseptics, dressings and bandages should be available in the school and at home.

Simple bruises should be washed with soap and an antiseptic like betadine applied.

In case of a deeper wound, the patient must be placed in a suitable position, bearing in mind that blood escapes with less force. The wound should be exposed

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and any foreign body removed with clean dressing. A prepared sterilized dressing, a gauze or lint should be used to control bleeding. In emergency, inside fold of a clean handkerchief or fresh towel or a clean piece of tissue paper soaked in iodine or spirit can be used. The dressing must be covered with a pad of cotton wool kept in place with a bandage.

Fainting usually results from being in a hot, stuffy atmosphere or standing still for a long time. Such a person should be helped to lie down flat and loosening any tight clothing around the neck, chest and waist. Crowd should not gather round, the patient should have plenty of fresh air around him. Water should be offered if the patient asks for it as he comes round. He should remain lying down for a few minutes before resuming work.

Minor burns should be cooled under a running cold tap for ten minutes, then covered with a sterile dressing and bandage.

If bitten by an insect (for example if stung by a bee), the bee- sting is removed by slightly scratching with a knife and then an ice-pack is applied to the affected area. If symtoms include severe swelling and pain, medical help should be taken. The casuality should be transported to hospital where an injection of antivenom will be given.

If a fracture to any bone is caused (usually an

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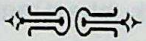
arm or leg), the limb should be immobilised by using sling or improvising a splint and the patient carefully carried to bone and joint specialist.

Safety devices and precautions are essential in handling electric circuits. Despite all precautions, it is possible that someone accidently contacts a live wire, one should try to provide such a person with support of wood, plastic, rubber or woollen blanket- a nonconducting material. The current must immediately be switched off. One should never try to pull away a person who has contacted the live wire.



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COMPUTERS

Computers as of now have taken the whole globe as a storm. It has become the buzzword of the present technological revolution as we say it. In the early days when a computer took up an entire room, programmers flipped switches to make the machine perform simple addition. These complex machines were the cutting edge in technology. They could add two numbers! As technology progressed, Punch cards provided more functic nality by allowing programmers to punch an entire line of code on a single card. Large programs were developed using Stack of cards. With the advent of I.C. technology the computers started growing smaller and faster. The pace of the development was so fast that in a short span of time the computers thronged to every nook and corner of the world and necessitated their presence.

DEFINITION:

A computer is a high speed electronic device capable of performing arithmetic and logical operations and of sorting

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executing a set of instructions, which will enable it to perform a series of such operations without manual intervention. In other words it converts data into the information after processing it through a predefined set of instructions.

Computers are categorized into Mainframe, Mini, Super mini, Micro and super Computers. Earlier the computers were confined to military, scientific uses like Space Launch programs and large universities that could afford them. The Computer has mindboggling range of applications in modern world. The computer has found its place in every department. It acts as our window to the world of information. Internet has shortened the boundaries of the world in terms of accessibility to any kind of information from any part of the globe.

Most of the computers are designed with single control, primary storage and arithmetic logic sections in the processor unit. Some computers have large multiprocessor systems having additional control, storage and arithmetic logic elements so that several instructions can be processed simultaneously.

The personal computer was made possible by the microprocessor, which offered the entire processing functions of a computer on a single chip. The development of personal computers is closely linked to that of the microprocessors.

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Components of computers are:

- Central Processing Unit
- Control unit
- Input & output unit
- Memory unit

CPU is involved in all the processing functions of a computer. It also contains the Arithmetic and Logical Unit that performs all the mathematical and logical calculation. All the calculations are performed in the binary codes that is 0 & 1.

Control unit controls the execution of all the operations performed by the computer. It is responsible for the execution of various processes concurrently. It can withhold the execution of a certain process by the interrupts.

Data is transferred between various components by the buses. A bus is a set of conducting paths used for transferring data and signals between two components or parts of the system. For high data transfer rates the bus connecting two system components should be as wide as possible and should be clocked at as high a rate as possible. For the highest speed of transfer it is necessary to use a dedicated bus between each system component but in practice this would prove too complex. Instead a single bus is often shared between a number of components. More modern designs have tended to abandon this

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single internal bus to connect standard system components and a separate external bus for additional system components required.

MEMORY:

Memory is required in a computer to store the programs and data processed by a program. The primary storage (main memory) is used for four purposes.

1) Data is fed into input storage area where it is held until ready to be processed.

2) A working storage space to hold the data being processed and the intermediate results of processing.

3) An output storage area holds the finished results of processing until they are released.

4) In addition to these data related operations, primary storage section also contains a program storage area that holds the processing instructions.

SECONDARY STORAGE MEDIA:

As we know that computer takes data as input, processes it and gives the output. Memory is used to store the data, programs and results. But the memory used here is volatile. It is called Random access Memory or RAM. As soon as power is switched off all the data stored in memory is washed out. So for permanent storage

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of data and programs some other media is needed, which can hold data permanently. This media is known as secondary storage media or secondary memory. Secondary memory stores data permanently even if power is absent. Secondary memory uses magnetic material to store data. These days a variety of secondary storage media are available some continuously use media are explained below:-

1. **Floppy Disks.**
2. **Hard Disks.**

1. 3.5 inch Floppy diskettes

These are also called micro- floppies. These floppies have 3.5 inch diameter. Capacity of these floppies is more than the 5.25 inch. These floppies have density of 135 tracks per inch (TPI), 80 tracks and 18 sectors per track so capacity is 2* 80* 18* 512 = 1.44 MB.

2. Hard Disk

While we have seen that floppy disk are used for permanent data storage. But capacity of Floppy disk is very less. Also when some data is to be read from floppy, first of all it has to be inserted floppy drive properly.

In computers today a large volume of data is required to be stored on secondary storage in this case Hard disks are best suitable. A hard disk has large capacity to store data and it is installed permanently inside system box. Data and programs that are frequently required are stored

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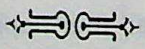
on Hard disk. Hard disks are also very fast in reading and writing as compared to floppy disks.

A Hard disk is basically a stack of disks mounted on a common spindle. A set of heads are provided for each disk. The disk pack is permanently packed inside a casing to protect it from the dust and moisture thus increasing its operational reliability and data integrity.

The data is fed to the computer by the input devices like Keyboard, Mouse, Joystick etc.

The data is displayed on the monitor or we can get the hard copy of the data through a printer. The printer is an electromechanical device. It has both electronic circuit control and mechanical assemblies. The electronic circuits control the mechanical assemblies. Electronic circuits in a printer are referred to as Printer Electronic or Control Electronics.



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VI EVERYDAY EXPERIMENTS

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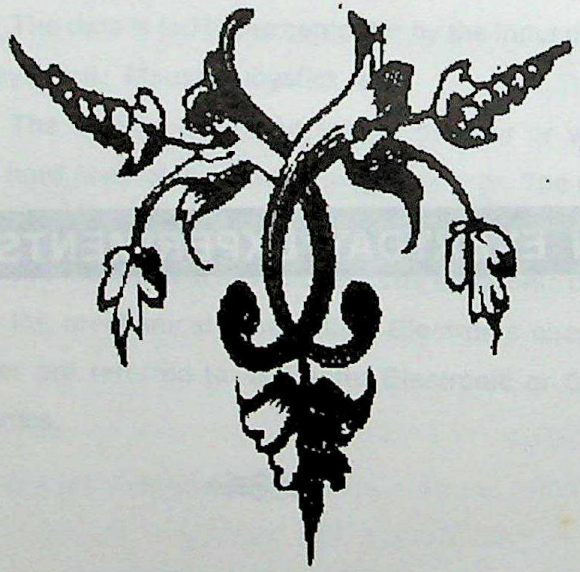

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1. AIR HAS WEIGHT

Balance a thin stick of wood by suspending it at its centre of gravity by a piece of thread.

Fill a rubber balloon with air and suspend it on one side of the stick and balance it by a standard weight on the other side.

Prick the balloon with needle sharply. The air comes out of the balloon and the stick gets titled showing air has weight.

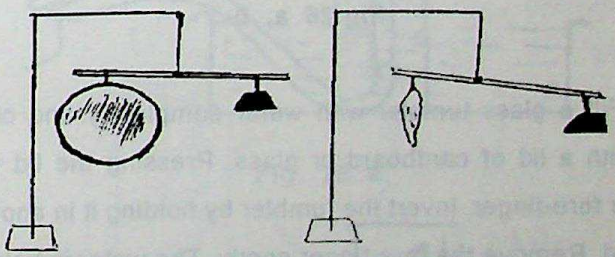

Fig: 25(a), (b)

2. AIR HAS PRESSURE:

a) Take a mobile oil tin-can, empty and dry. Take some water in it and boil the water by heating the can on a heater. Water vapour produced as steam drives out air from inside of the can.

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As the air is driven out, close the neck of the can with the lid tightly. Cool the tin-can by dropping cold water on the outside. The tin can collapses as the air pressure from outside acting on it.

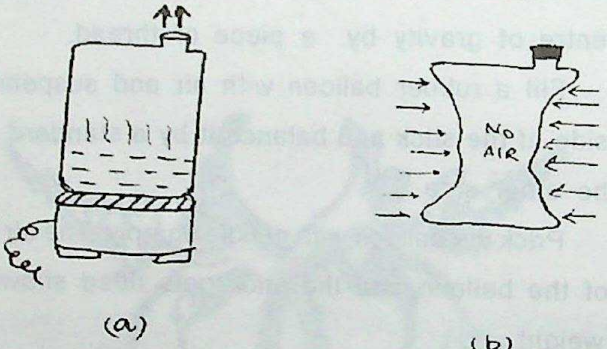

Fig:26 a, b

b) Fill a glass tumbler with water completely and close it with a lid of cardboard or glass. Pressing the lid with your fore-finger, invert the tumbler by holding it in another hand. Remove the fore-finger gently. The water is held by the lid in the glass tumbler by the atmospheric pressure.

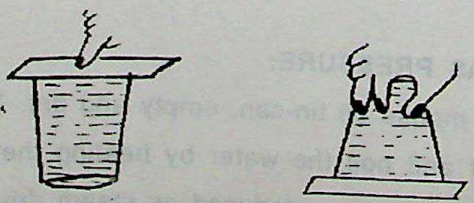

Fig:27

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3 AIR OCCUPIES SPACE (AIR HAS VOLUME):

Take a trough of water and put a bee-hive shelf in this water, Invert a jar full of water over the beehive-shelf. Insert a rubber tube from under the beehive shelf into the jar of water. Blow air through the rubber tube into the jar. Water drops down and air occupies the space of water. Suck in this air through the rubber tube. Again water rises up the jar to occupy the space emptied out of air.

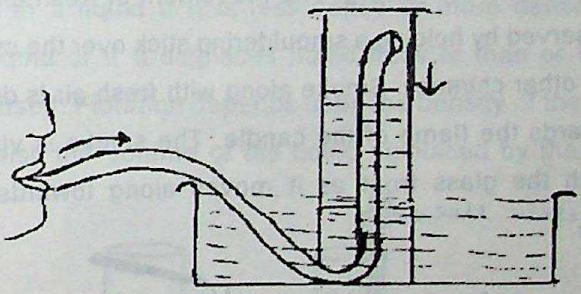
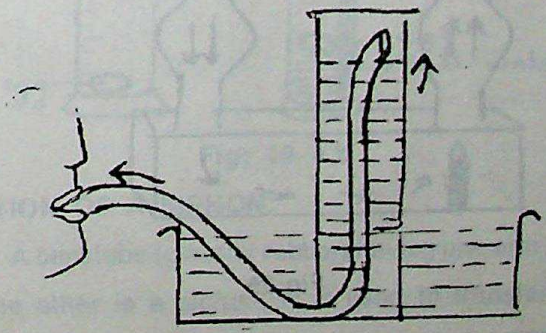


Fig: 28 a



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4. AIR EXPANDS ON HEATING (VENTILATION EXPERIMENT)

Take a cardboard box and fit its front with a glass sheet. Fit two glass chimneys in the lid of the box by making two big holes in the lid. Remove one chimneys and introduce a candle inside the box through the hole. Light the candle and replace the chimney. Air inside the box gets heated up, expands and rises up through one chimney. Fresh air enters through the other chimney and keeps the candle burning. The movement of fresh air can be observed by holding a smouldering stick over the mouth of the other chimney. Smoke along with fresh air is drawn in towards the flame of the candle. The smoke is visible through the glass front as it moves along towards the candle.

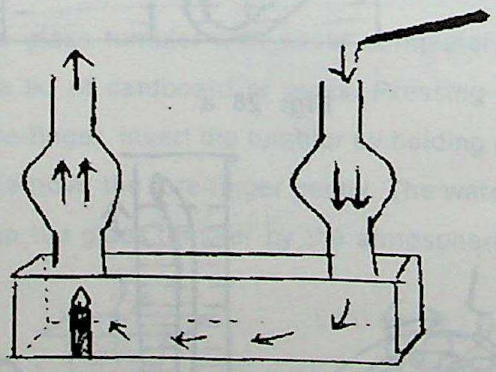

Fig:29

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5. FLOTATION:

Take some clear water in a tall jar of glass. Drop gently a fresh egg into this water. It sinks to the bottom of the jar. Now pour through a thistle-funnel along the side of the jar a solution of common salt. The salt solution being denser sinks to the bottom and the egg rises up to float on this solution. Fresh water also floats on salt water and the egg remains midway floating on the salt water whereas sinking in fresh water. A body floats or sinks in a liquid if it is less dense or more dense than the liquid or if it displaces liquid heavier than or lighter than itself. Flotation depends upon the density of the liquid and also the volume of the liquid displaced by the body.

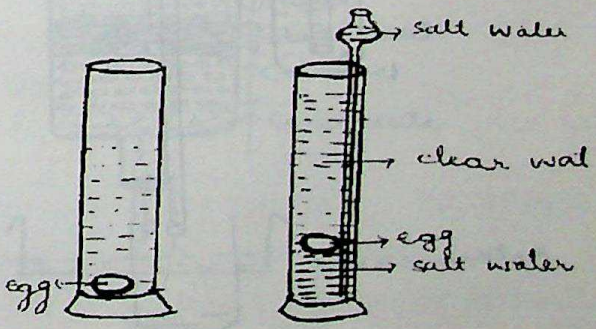

Fig: 30 a,b

6. ACTION OF A SIPHON:

A bent tube (glass or rubber) having one arm shorter than the other is a siphon. It is used to transfer liquid from a higher vessel to a lower vessel. Let ABCD be a

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siphon. The shorter arm is dipped in the higher vessel. As the air is sucked out of the tube from the lower end D, the liquid from the higher vessel continues to flow out into the lower vessel till the upper vessel is emptied out. The atmospheric pressure at the lower end D pushes the liquid up whereas the atmospheric pressure plus the weight of the liquid ED pushes the liquid down. The combined pressure from above being greater, the liquid continues to flow out.

Siphon cannot work if the longer arm of the tube is immersed in the liquid in the higher vessel

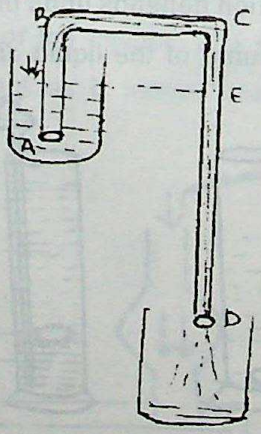

Fig:31

7. SAND FILTER:

Take a big bottle and carefully remove its bottom. Invert it. Close the neck with a cork through which passes

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a small glass tube. Tightly put pieces of concrete at the bottom and then another layer of clear gravel over it. The third layer should consists of charcoal pieces and the layer above it that of fine clear sand. The layers should be tightly pressed. This forms a sand filter. Pour muddy water from above. Clear transparent water flows out of the tube at the lower end. All the impurities are retained by the various layers.

Such big sand filters are used to purify town water supply. Even bacteria are retained by the filter. After chlorination such pure water is supplied to the town.

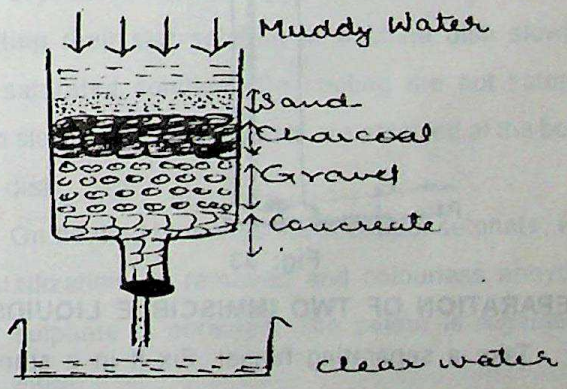

Fig: 32

8. FIRE UNDER WATER:

Take a tall glass jar. Put a piece of white phosphorous at its bottom and cover the phosphorous piece

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with cold water. Through a thistle funnel pour a few drops of concentrated sulfuric acid into the water at a time to meet the white phosphorous piece. Phosphorous piece burns to form fire under water. Concentrated sulfuric acid produces heat as it mixes with water and the heat produced sets white phosphorous ablaze because it has low ignition temperature. Use little piece of phosphorous at a time.

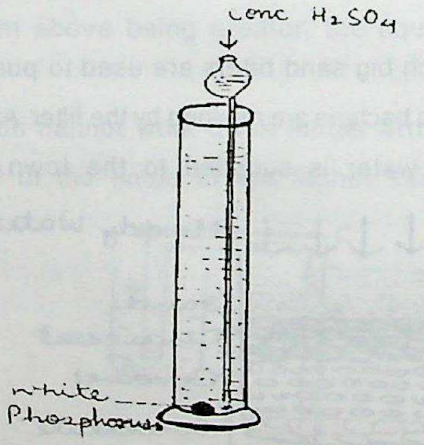

Fig: 33

9. SEPARATION OF TWO IMMISCIBLE LIQUIDS

Take a separating funnel. Fix it in a stand. Put oil (kerosene oil) and water mixture into the funnel. Let the two liquids settle and separate into two layers- water at the bottom and oil floating on it. Open the stop-cock slowly. Water flows out into a beaker. As soon as the last drop of water flows out, close the stop-cock. Oil remains in the funnel, separated from water.

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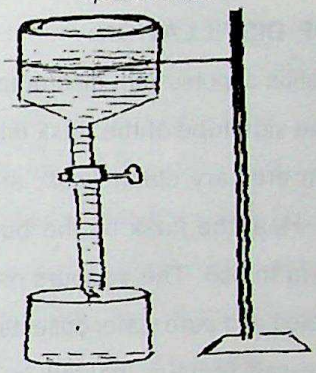

Fig: 34

10. CRYSTAL FORMATION:

Crystals of alum or copper sulphate can be obtained by heating their salt solution in a china dish slowly to obtain saturated solution. On cooling the hot saturated solution slowly, fine pure crystals are obtained at the bottom of the dish.

On heating blue crystals of copper sulphate, water of crystallization is removed and colourless anhydrous copper sulphate is obtained. The colour is regained on adding water.

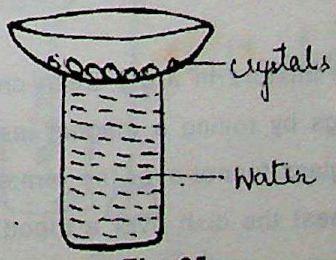

Fig 35

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11. PROCESS OF DISTILLATION:

Take a solution of potassium-dichromate, in a distilling flask. Introduce the side tube of the flask into a condenser. Put a receiver, an ordinary clean flask, at the other end of the condenser. Heat the flask by the burner. Allow the dichromate solution to boil. The vapours pass through the condenser, get cooled and pure water collects in the receiver. The impurities-the-salt remains behind in the flask. Distillation separates soluble salts from sea-water.

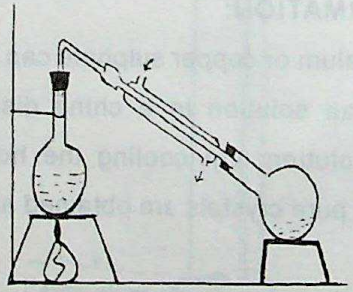

Fig:36

12. SEPARATION OF A MIXTURE OF SAND, IRON FILINGS, COMMON SALT AND AMMONIUM CHLORIDE INTO ITS CONSTITUENTS:

Place the mixture in a dry clean china dish and remove iron-filings by rolling a magnet inside it.

Invert a glass funnel over the remaining mixture in the dish and heat the dish over a tripod. Ammonium chloride changes into vapours which condense on the cooler

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portions of the funnel. The sand and common salt are left behind in the dish. Pour this remaining mixture into some water contained in a beaker. Stir the mixture and warm it over a tripod stand. Common salt dissolves in water. Filter the solution. Sand remains on the filter paper. Evaporate the salt solution to get common salt. Ammonium chloride is scratched from the walls of funnel. In this way the various constituents are obtained

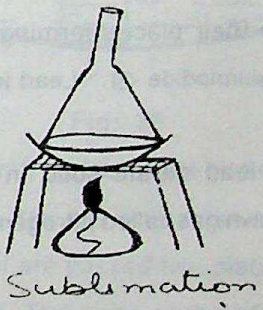

Fig: 37 a

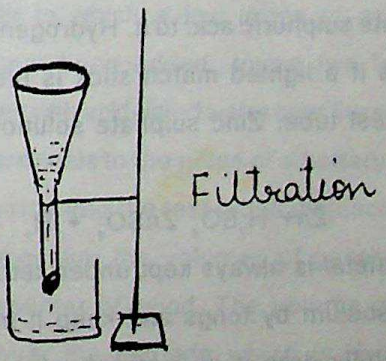

Fig: 37 b

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13. SOME CHEMICAL REACTIONS:

a) Hold a piece of magnesium ribbon by a pair of tongs and heat it in the flame of a spirit lamp. It burns with a dazzling light forming magnesium oxide.

Magnesium + oxygen ⌫ Magnesium Oxide

b) Take some lead nitrate solution in a test tube and add few drops of potassium iodide to it. A heavy yellow precipitate of lead iodide is formed. The constituents of the reacting substances change their places forming new substances

Lead nitrate+ Potassiumiodide ⌫ Lead iodide + Potassium nitrate

c) Heat a little of lead nitrate solid in a dry test tube. Fumes of yellow-brown gas called nitrogen dioxide are given off.

Lead nitrate ⌫ Lead oxide + NO_2

d) Take a few pieces of granulated zinc in a test tube and add dilute sulphuric acid to it. Hydrogen gas is evolved which burns if a lighted match stick is brought near the top of the test tube. Zinc sulphate solution is left in the test tube.

$$Zn + H_2SO_4 \; ZnSO_4 + H_2$$

e) Sodium metal is always kept under kerosene oil. Take a piece of sodium by tongs and keep it in a wire-gauze piece. Carefully drop it in a trough of water, placing a

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test tube full of water over the piece wrapped in wire-gauze. Water in the test tube is at once replaced by hydrogen gas. Sodium + water ⌫ Sodium hydrocide + H_2

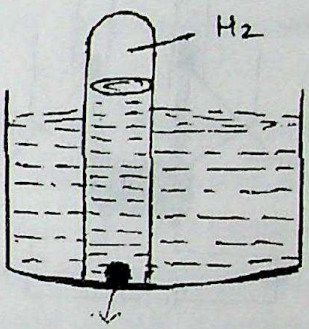

Fig: 38

f) Take a voltameter. It consists of a glass vessel mounted on a wooden base. You can improvise one. Through the bottom of the vessel are passed two platinum wires which serve as electrodes. The ends of the platinum wires are connected to the terminals on the base. The voltameter is filled with water to which a few drops of acid (dilute sulphuric acid) have been added. Invert two test tubes of the same size filled with acidulated water over the electrodes. Connect the two terminals to the poles of a battery. Bubbles of gas are seen to rise into the test tubes displacing water. After sometime, measure the volumes of gases and test them by burning splinter of wood. The volume of the gas in the test tube over the cathode which is Hydrogen is double the gas collected over anode which is oxygen.

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$2H_2O \rightarrow 2H_2 + O_2$

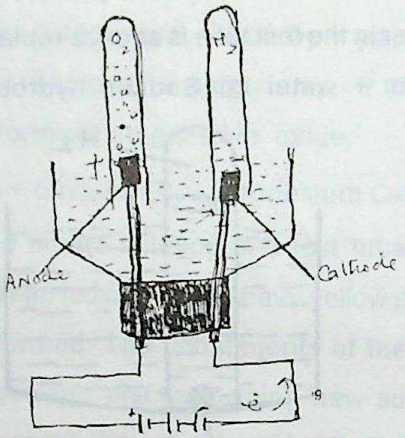

Fig: 39

g) Take a little of ammonium hydroxide solution in a test tube and hold a rod dipped in strong hydrochloric acid over and near it. Dense white fumes of ammonium chloride are formed.

$$NH_4OH + HCl \rightarrow NH_4Cl + H_2O$$

h) Take a little dilute solution of caustic Soda in a beaker. Add a drop or two of phenolphthalein to it. It turns pink. Add drops of dilute hydrochloric acid to the beaker gently till the pink colour just disappears forming salt.

$$NaOH + HCl \rightarrow Na\,Cl + H_2O$$

i) Take some copper sulphate solution in a beaker. Heat it slightly. Dip a shining balde of a knife in the solution. The blade is covered with a red layer of copper.

Iron + Copper Sulphate → Iron sulphate +Copper

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j) Take some copper chips in a test tube. Add concentrated sulphuric acid to it and heat. Sulphur dioxide gas is evolved which turns moist filter paper soaked in potassium dichromate solution green. Also the gas bleaches a wet coloured flower.

$$Cu + 2H_2SO_4 \xrightarrow{\Delta} CuSO_4 + 2H_2O + SO_2$$

k) Take a little of sodium nitrate solution (any nitrate salt solution) in a test tube. Add some freshly prepared ferrous sulphate solution to it and then a few drops of concentrated sulphuric acid along the side. A golden ring of nitroso-ferrous sulphate is obtained.

Fig: 40

l) Take some copper chips in a test tube and add concentrated nitric acid to it. A brisk action takes place. Brown fumes of nitrogen peroxide gas are evolved and the solution in test tube is copper nitrate which is green.

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$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$$

m) Take a little of sodium chloride solution in a test tube. Add to it a few drops of silver nitrate solution. A white precipitate is formed. Shake. Add ammonium hydroxide solution to it, the precipitate dissolves.

$$NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$$

White ppt.

n) Take some barium chloride solution in a test tube. Add a few drops of dilute sulphuric acid to it. A thick white precipitate of barium sulphate is formed.

$$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$$

white ppt

o) Take some potassium permanganate solution in a test tube. Add a little dilute sulphuric acid to it and heat. Add a crystal of oxalic acid. The colour disappears.

p) To the solution of mercury chloride in a test tube, add a little quantity of potassium iodide solution. A red coloured precipitate is obtained

14. BLUSHING GIRL EXPERIMENT:

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Take a white doll. Apply phenolphthalein with a brush to its face. Stand it in a bell jar placed on a cardboard having two holes in it. Through one hole pass a rubber tube connected to ammonia gas generating apparatus (Heating of slaked lime with ammonium chloride). The rubber tube is fitted with a clamp a little below the cardboard. Through the second hole pass another rubber tube similarly fitted with a clamp but connected to a hydrochloric acid gas generating apparatus. (Heating common salt with concentrated sulphuric acid). On allowing only ammonia gas to pass through the hole, the 'girl' blushes (turns pink). Now cut off the supply of ammonia gas and pass hydrochloric acid gas. The 'girl' regains normal complexion

15. LOWER THE ATMOSPHERIC PRESSURE, LOWER IS THE BOILING POINT OF WATER:

Boil some water in a round bottomed flask closed with a cork having two holes, a Celsius thermometer passing through one hole and a bent glass tube through the other hole. Note the boiling point of water when the temperature remains constant. Remove the burner so that the boiling stops. Remove the cork with thermometer and the bent tube and close the neck with a cork tightly. Invert the

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flask slowly over a tripod stand in a trough. Add plenty of cold water quickly over the outside of the flask. The steam inside condenses and low pressure is caused above the hot water surface. The water begins to boil at a lower temperature. Water boils at sea-level at 100 deg. cel but as we go up, the boiling point is lowered. In Srinagar it boils at 94..5 deg cel. and so on at low temperature at higher altitudes.

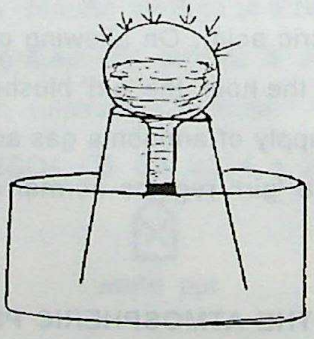

Fig: 41

16. SOLIDS, LIQUIDS AND GASES EXPAND ON HEATING

a) Take a Gravesand's ball and ring apparatus. The cold ball passes through the ring easily. Now heat the metal ball on a burner (a spirit lamp) for some minutes holding the ball by wooden handle. Place the hot ball on

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the ring. It cannot pass through the ring. Heat expands the ball and increase its size.

b) Fill a round- bottomed flask with water and close its neck with a cork through which passes a long glass tube. Press the cork so that the level of water is visible in the tube. Heat the flask on a tripod holding the flask by a stand. The level of water goes on rising in the tube showing liquid expands on heating. As burner is removed, the level of water in the tube will fall on cooling.

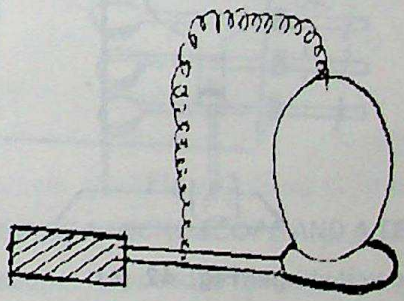

Fig: 42 (a)

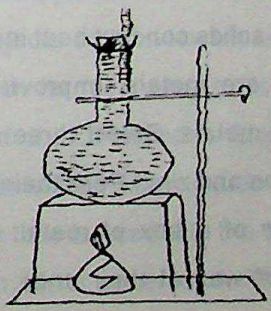

Fig: 42 b

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c) Fit an empty round-bottomed flask with a cork through which passes a long glass tube. Invert it and clamp it in an iron-stand. Let the lower end of the long glass tube dip into coloured water in a beaker.

Warm the flask from outside by a burner. The air inside the flask expands and bubbles are seen rising through the coloured water. On cooling the flask, coloured water rises into the tube to take the place of expelled air.

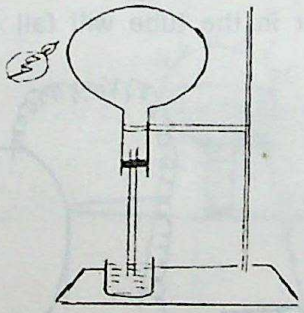

Fig: 42 (c)

17. CONDUCTIVITY OF DIFFERENT SOLIDS (METALS) IS DIFFERENT:

Different solids conduct heat in different ways. The best conductors are metals. Improvise an apparatus to conduct heat by metals. Select three spoons of different metals (silver, iron and zinc) Pass their arms through corks fitted in the side of a box of metal. Then attach paper clips by drops of wax at their ends. Drop boiling water into the box. Heat is conducted by the metals of the spoons

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till it reaches the handles of the spoons. The wax melts and the paper clips fall off one after another. The paper clip from the silver handle will fall first showing silver is the best conductor among the three.

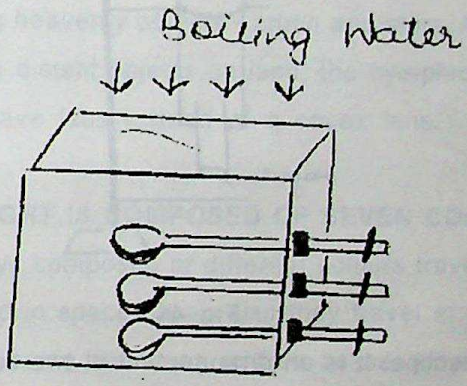

Fig: 43

18. SETTING UP OF A MICROSCOPE AND A TELESCOPE:

a) Microscope: It is used to magnify tiny objects. Two convex lenses one of very short focal length and another of large focal are selected. The lens with small focal length faces the tiny objects to be viewed and kept slightly at a level higher than its focal length from the tiny object. This lens is called objective and is fixed at the lower end of the inner tube which slides inside a larger tube.

The larger tube is fixed with the convex lens having large focal length at its upper end. This lens serves as the eye-piece close to the eye. The two sliding tubes

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are fixed vertically in a stand. On raising the eye-piece which magnifies furth[illegible]e image formed by the objective, a microscope is set up.

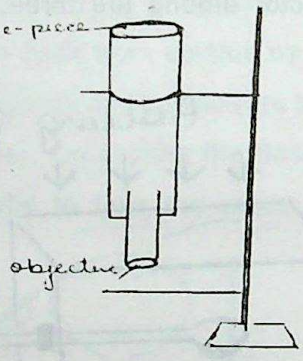

Fig 44

b) Telescope: It is an arrangement of two convex lenses of different focal lengths for viewing distant objects. The objective of large focal length is fitted at the outer end of the large tube to face a distant heavenly object or a distant tree. The eye-piece is of small focal length and is fitted at the outer end of the inner tube which slides in the larger tube.

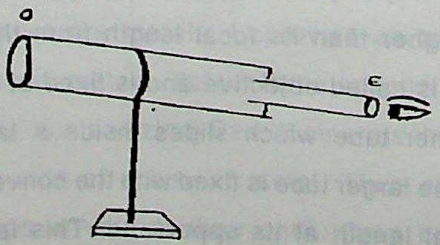

Fig 45

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The two lenses are fixed horizontally in a stand. We look through the eye-piece of small focal length and on adjusting the tube in and out, the distant object is seen near our eye. The image formed by such a telescope is inverted. This does not matter if the telescope is used for viewing heavenly objects - moon and stars. However, for viewing distant objects on land, the eye-piece has to be a concave lens instead of a covex lens.

19. SUNLIGHT IS COMPOSED OF SEVEN COLOURS:

a) Light rays composed of different colours travel at the same speed in space. In air also they travel at approximately the same speed as in free space. However, in glass, water and in other materials light rays of different colours travel at different speeds. So they bend by different amounts when passing through a prism or rain-drops which act as prism. A rainbow is formed due to this splitting.

Take a glass prism and allow a narrow beam of sunlight to fall on one face. Let the colours emerging out of the other face fall on a screen. The white sun rays split into seven colours- violet, indigo, blue, green, yellow, orange and red (VIBGYOR). Dispersion causes violet ray to refract most and red ray least. Place a second prism of the same angle upside down parallel to the emerged spectrum. The second prism recomposes the colours into

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the original white sunbeam.

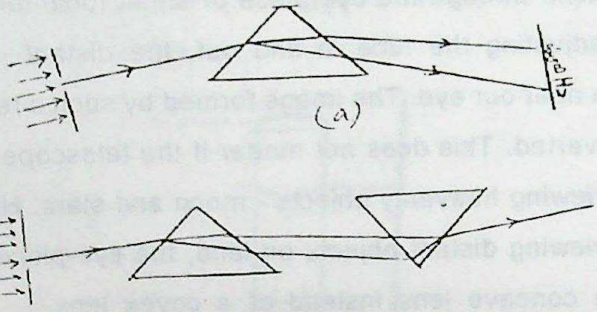

Fig 46 a, b

b) Take a circular sheet of white paper. Divide it into seven equal sectors. Colour each sector with different rainbow colour- violet, indigo, blue, green, yellow, orange and red. Glue this sheet of seven colours to a cardboard disc of the same size. Pass a sharp long nail into the middle of the disc. Set the top thus obtained in rotation. The colours mix-up producing almost white colour.

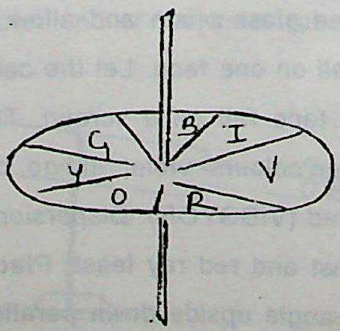

Fig 47

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20. PRINCIPLE OF AN ELECTRIC MOTOR

Rotational motion can be produced in a conductor carrying current by placing it in a magnetic field. Fit a wide glass tube with corks at two ends. Through the lower cork pass a strong bar magnet. Put mercury round the magnet. Through the middle of the upper cork pass a wire with a hook inside and suspend a moveable conductor (wire) from the hook so that its lower end dips in mercury. Complete the circuit by connecting the upper end of the hooked wire through a battery, a key and a wire which is inserted in the liquid mercury. On passing the current (as the plug is inserted in the key hole), the moveable wire immersed in liquid mercury rotates, round the magnet.

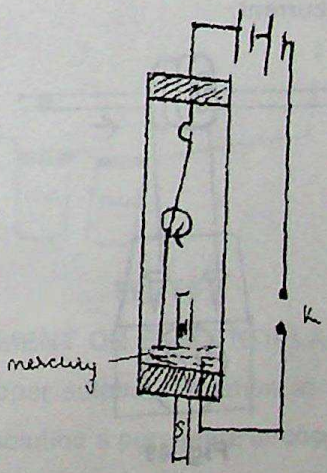

Fig 48

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21. ELECTRO-MAGNETIC INDUCTION OR PRINCIPLE OF A GENERATOR.

Electro-magnetic indution is the opposite of the electric motor concept. Electricity can be generated by moving or rotating a coil within a magnetic field or by moving a magnet within a coil.

Wind an insulted copper wire in the form of a coil and connect its free ends to the terminals of a voltmeter. Quickly insert a strong bar magnet through the loop of the insulated coil. Current is produced which is detected by the pointer of the voltmeter. Pass out magnet through the coil, induced current is detected in the opposite direction. Take the magnet in and out through the coil to get the induced current.

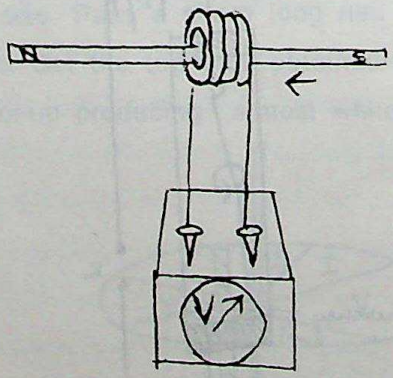

Fig 49

22. ELECTRO-MAGNET

Take a piece of soft iron. Wind neatly, closely

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and in one direction insulated copper wire round it to make a solenoid (closed coil round the iron-piece). Connect the free ends of the long insulated wire through a key to a strong battery - two or three volts each in series. Pass the current. The soft iron becomes a magnet. It can attract pieces of iron and its north pole (say) will repel the north pole of a magnetic needle. Stop the current and it loses its magnetism. Such magnets are useful to work a door bell, telephone, telegraph and electric lifts. Larger the number of turns in the solenoid and stronger the current, greater will be the strength of electromagnet.

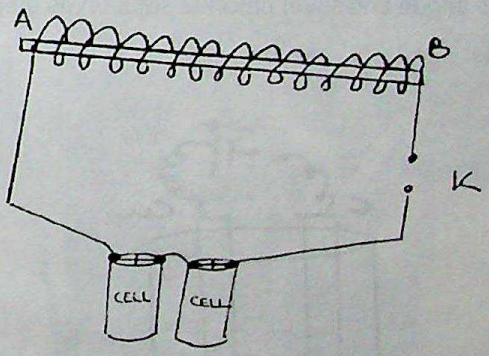

Fig 50

23. AN EXPERIMENT ON ELECTROPLATING:

Take copper sulphate solution in a wide beaker. Immerse in the solution a pure plate of copper and a clean carbon rod of a used dry cell. Connect the copper plate to the positive terminal of a battery and carbon rod to

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the negative terminal. Pass the current, the carbon rod gets deposited with pure copper from copper sulphate solution. To make up this loss copper from the copper plate gets dissolved into the solution. Electroplating is used to cover an inferior metal by a pure metal by the process of electrolysis. Electroplating is done to protect inferior metal from corrosion and also for decoration. Similarly, nickel plating on iron spoon can be arranged by using a nickel rod as anode and iron spoon as cathode in a solution of Nickel- ammonium sulphate.

For silver plating an iron spoon as cathode, silver rod is used as anode and silver chloride solution as electrolyte. Apparatus is similarly set up.

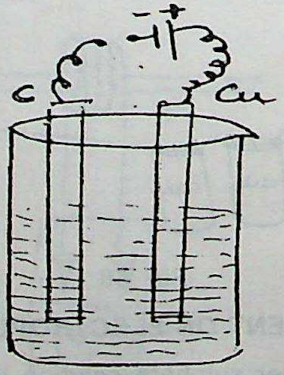

Fig 51

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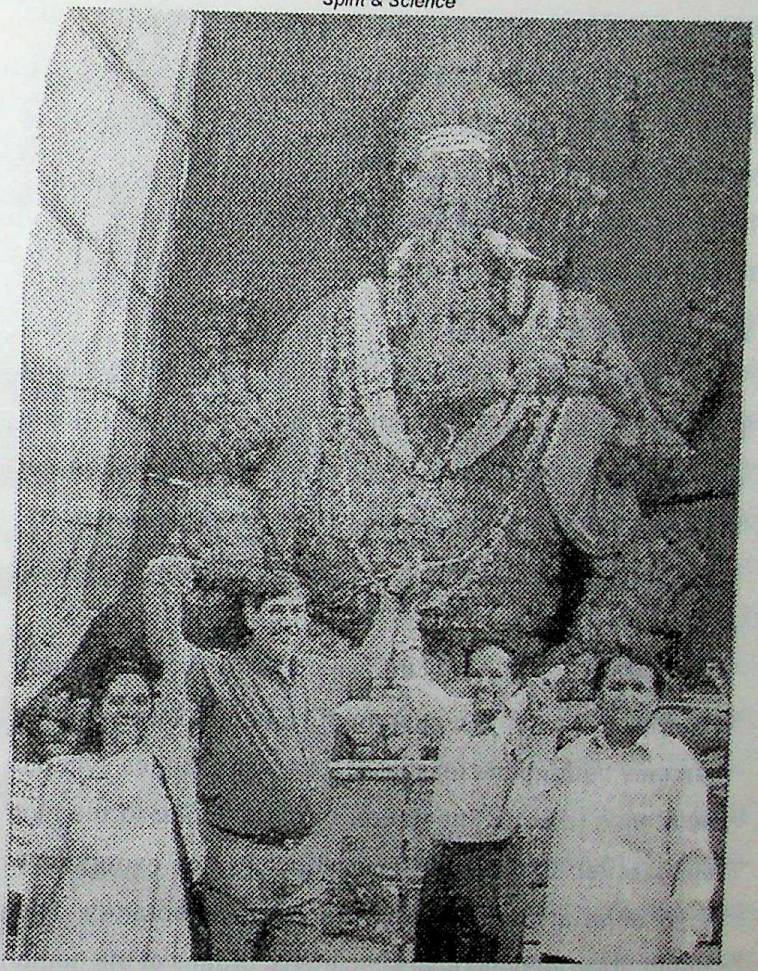

An idol of Ganesh, made of 5,000 coconuts, on display in Bangalore on Thursday, mid June, 1999. The idol was created for communal harmony by Rita (left), a Christian, her Hindu husband Satish Mahajan (second from left), a Muslim bussinessman S.A. Balqhi (second from right) and a Muslim merchant M.D. Ibrahim (right)

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EPILOGUE

A) SCIENCE TEACHING:

Teaching of science cannot be done like teaching English text book or social study book by dictating notes and asking children to learn answers to the questions at the end of the chapter and memorizing answers like parrots. This method, unfortunately, is prevalent in majority of schools even at present.

We have to see that in Science teaching there is always more doing, experimenting and observing rather than only hearing the lesson. Most of the Science syllabus itself lends to experimentation from the junior to the high school level. Children should actually watch experiments being done in the class room or in the laboratory. They should observe biological specimens, organs of the human body in the models, experiments on measurement, simple machines and chemical reactions actually taking place in the course of teaching. Classes should be taken to laboratory at east once a week by turns so that all get a chance to observe things for themselves.

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Science teacher should actually teach the lesson by taking the particular equipment, illustration or model to the class room with the help of the laboratory assistant or the monitor of the class. To make the work of the teacher easy and smooth and avoid delay, the teacher should hand in a written list of things he needs for teaching the lesson to the laboratory assistant in advance so that the assistant keeps the apparatus and chemicals required in readiness in the particular period. Science teacher should never read out the lesson from the text book but write the result of the observations briefly on the blackboard obtained by actual participation of children in the lesson demonstrated and draw necessary diagram. Here some examples of experiments actually demonstrated in teaching periods are given. Children have watched rain-formation by actual condensation of steam from a boiling kettle, have obtained salt by evaporation, observed the differences between magnetic and non-magnetic substances by working with magnets, have plotted magnetic fields. They have observed germination of seeds and plant-growth, life-cycle of a silk-worm and development of a frog from a tadpole. They have handled spring and common balances, graduated jars and obtained masses, volumes and density of solids and liquids. They have found weight by applying the principle of moments. All this in junior classes.

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In middle classes children have determined the composition of water by volume by improvising a voltameter. They have set up sand-filters to obtain clear water from muddy water. They have proved that air has mass, volume and pressure. They have watched the simple tests performed in finding the difference between an acid and an alkali, a metal and a non-metal, the action of an acid on a salt or a metal and have identified the gas evolved. Innumerable examples can be given from the science course which can be taught through experiments and models in the teaching period. Further taking temperatures of hot and cold waters and determining that heat lost is equal to heat gained by mixing the waters. Finding specific heat of solids and liquids can be taken up. Fitting apparatuses to prepare samples of gases like oxygen, hydrogen, carbon dioxide, sulphur dioxide, hydrochloric acid gas and nitric acid should be done and children should bend glass tubes and bore corks for this purpose. Tests for such gases prepared should be done to create interest and practical experience among the children. Study of various chemical reactions, decomposition and displacement reactions, distinction of mineral acids, organic liquids, disinfectants and germicides have to be learnt by actual observations.

Identification of useful and harmful insects, microbes and blood cells can be done by using a magnifying glass

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or a microscope. Children can set up electric circuits, electric motor, dynamo and other electronic gadgets, and can know the difference in structure of various atoms like sodium and chlorine by observing or making their models. Science knowledge being vast and increasing over years with new discoveries and inventions, each high school child should be encouraged to do a project or make a model every year. Children should be able to collect information about control of fires, control of various fatal diseases, cause and control of air and water pollution, aeronautics, diode and transistor, broadcasting and television, energy crises, alternate sources of energy, atom and atomic energy, radioactivity, photography and so on. Field trips to places of scientific interest should be arranged by the school every term of the year. Students can visit trout hatchery, wild-life sanctuaries, zoo, water purification plant, cement, steel, match and chemical factories, radio and T.V. stations, telephone exchange, hydro-electric or thermal power stations, preventive-disease section of a medical college, weather observatory, state museum etc. to gather information and observe the working and layout of such plants. For this purpose high school students should maintain a scrap book each besides the ordinary note-book of science and practical-file where such latest information, pictures of scientists, day to day science news can be recorded.

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Even various seeds, pressed leaves of various plants, herbs and flowers can be maintained. Students can learn a lot of science through doing and this will make science teaching lively, interesting and meet the needs of modern science. Extra books in science should be provided by the library to children to widen science knowledge.

Every year science exhibition and science-quiz should be held in the school where students participate actively. Visitors and parents should be invited so that students are able to explain various science phenomena and principles and their own models and projects of the year. Parents can watch the performance of scientific experiments, display of models, projects, Science charts and posters made by their children and appreciate the high standard of work done by them.

Science teacher has to make a list of multiple choice questions from the syllabus of science as well as from the project work of children and arrange a science quiz along with science exhibition. Such an exercise will make students thoughtful, active and real junior scientists. Talented students only will be willing to do this extra work and preparation for the quiz. Questions such as:

1. Why are some persons colour-blind?
2. What are X-rays?
3. Who invented dynamo, electric lamp, lightning conductor

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etc.?

4. Who did the first human-heart transplant?
5. Who discovered malarial parasite?
6. What is a cardiograph?
7. What is carburetter?
8. What is a cyclotron?
9. What is nuclear reactor?
10. What is difference between an atom and an ion?
11. What is the velocity of light in air? And so-on should be included in the quiz.

It is a bit of extra-work for the teacher but it will make the teacher outstanding and bring respect and honour to the teacher in every way. The result that he will achieve in science teaching will be rewarding.

Lastly, the science teacher should invite an expert engineer, a doctor or a scientist to give students a talk on any scientific topic once or twice a year, through a video-film if possible. Science teaching and learning has to be all comprehensive to create scientific temper among children.

b) RELIGIOUS TEACHING:

Children have to get religious teaching from home people according to the religion the parents profess. They have to follow the rituals, the customs and the method

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of prayer according to the faith at home. But this does not mean that the teacher in the school is not to perform his or her duty to humanity to preach children how they have to become citizens of the world by respecting all religions as they respect their own. Children have to develop in such a way that they develop cosmic love for humanity and do not have a trace of hatred for different sections of society. "One school master is worth a thousand priests". The teacher himself or herself has to be good-natured, simple, honest, sympathetic like parent and loving. He or she has not only to speak through words but also through his or her life. Every lesson that the teacher teaches should begin with a spiritual quotation or saying of any great philosopher or great teacher and the children should be asked to write this on their notebooks in the beginning of the lesson or the chapter. Little explanation of the quotation should be given and this will make a deep imprint on the young minds.

Children should be asked to do little acts of kindness, to help the needy and to be truthful and honest. Children will imbibe religion if they are given the opportunity of doing practically good deeds. They should be taken in groups to visit a hospital with flowers for the recovering patients, or to visit a leper-hospital taking fruit, medicines, clothing and some kind of entertainment for the suffering humanity.

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They should visit a poor colony to clean it and distribute milk and sweets to the poor inhabitants. Children should be taught to fight any kind of evil in society like corruption, superstition, dishonesty, drug-abuse, adulteration and black-marketing. School children should come out to help the people in time of distress like fires, floods, earthquakes, civil-defence, and work for the good of humanity and shed all selfishness. Good teachings of all religions can be given to the children in the assembly by the head teacher. For example from the holy Bible can be taught: "Blessed are the pure in heart, for they shall see God". And this purity of heart and mind leads to immortality, so say all religions. It is the duty of every teacher to teach morality, good neighbourliness, good manners to those whom they teach various subjects. Stories of great men and philosophers like Mahatma Gandhi, Rabinder Nath Tagore,Lev Tolstoi, Abraham Lincoln, Kabir, poet Iqbal will instill goodness and greatness among children.

Children should sing hymns and pray together in the assembly pertaining the universal God and for the good of humanity at large.

Spirituality can thus be instilled through practical help the children render to others and also through great lessons from all religions and saints. There must be a moral-science period a week for every class and teachers

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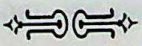
of all religions should share the responsibility of taking such classes in the school. Children have to imbibe through moral lessons not to be greedy, not to tolerate social injustice, to save environment from pollution, to respect human (both male and female) values, to love all communities, all mankind, especially the poor and the needy. It is the duty of the teacher to civilize humanity by example, word and deed.

"Science is our future. There is only one solution for India's economic problems and that is science, and more science and still more science".

"We have just enough religion to make us hate, but not enough to make us love one another" Jonathan Swift.



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ABOUT THE AUTHOR

The author served as an outstanding teacher and headmaster in the premier school of Srinagar, Kashmir - the Tyndale Biscoe School, for over 40 years. The British council sent him to train for a whole term in Scotland in 1964. Among his illustrious pupils stand out those who are Chief Ministers, High Court Judges, great doctors, and social and government officials who continue to give the credit for their success to this great teacher.

He has also authored several J&K Board approved Science text books and the book — "Our Reminiscences - Tyndale Biscoe School".

About the book

For the balanced development of students it is essential to teach them basic tenets of all Religions (Sans Orthodoxy) and Sciences physical (emphasis on practicals). This book spirit & Science tries to guide the students on these lines. It is an honest attempt by the author who has himself been a dedicated Science cum moral teacher having obtained good results in moulding the character and mental calibre of those under his care.

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